Flying Safety

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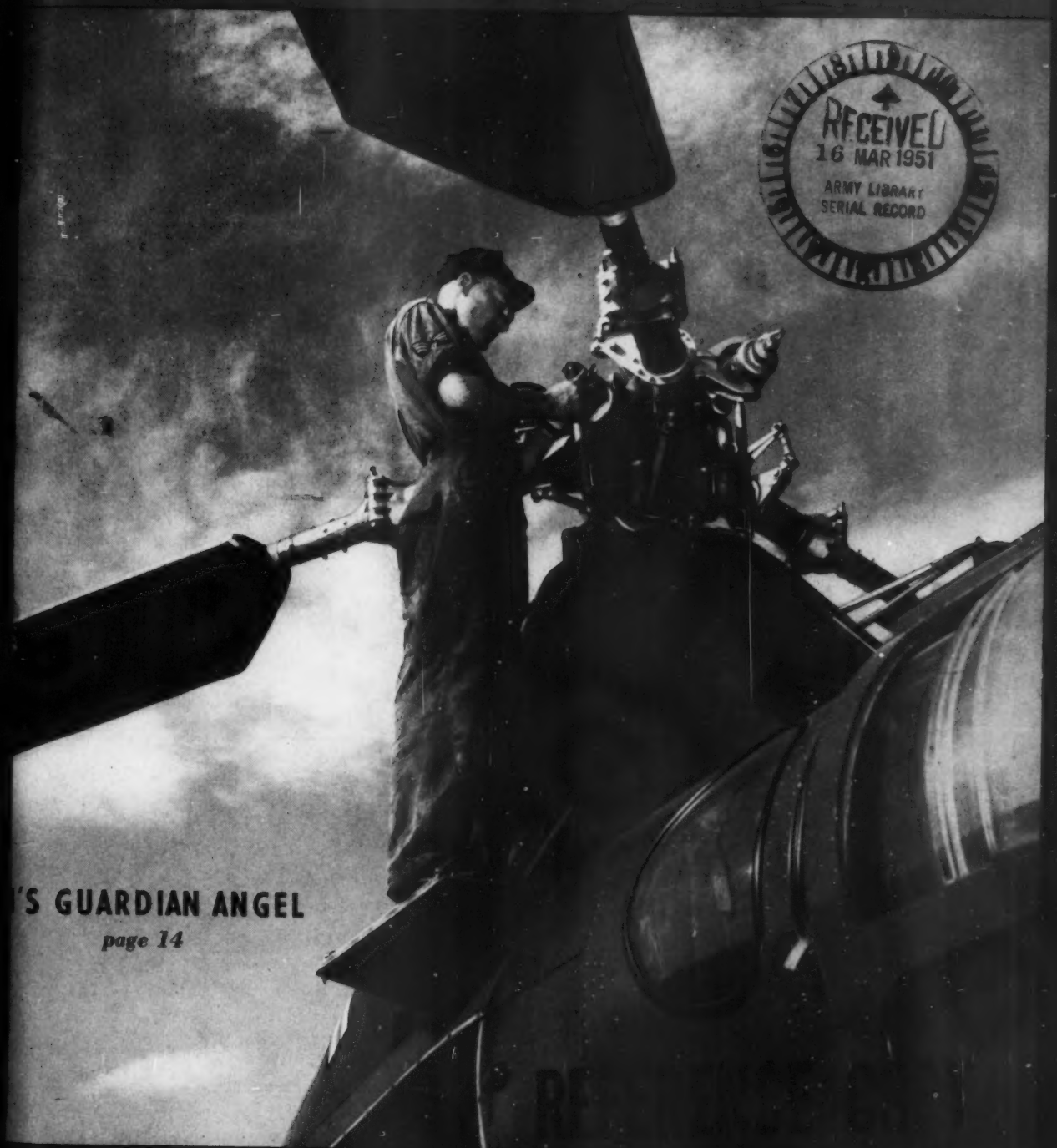

'S GUARDIAN ANGEL
page 14

Special feature: FLYING THE THUNDERSTORM

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"BE PREPARED"

TRAINING for the future by being prepared to aid crash survivors, the Air Explorers of the Honolulu Boy Scout Council held a week-end encampment to add to their knowledge of jungle survival.

This expedition was led into a remote "jungle" section near Bellows AFB, Oahu, after dark, and through USAF and Civil Air Patrol coordination successfully survived their "bailout." Actually, *MANY AN AIRMAN OWES HIS LIFE TO EXPERT WOODCRAFT DEVELOPED THROUGH SCOUTING*

1—Searching for their rations which have been dropped by parachute into the rugged terrain near Bellows AFB, these Air Explorers are learning the methods of rescue and survival the best way.

2—"That's North, No' East," points T/Sgt. Raymond L. Perry, of Fourth Air Rescue Squadron, as he demonstrates the use of a Lensetic compass before starting a searching problem.

3—The first important task upon landing is care of the "wounded." These first-aid teams are working on "patients" prepared by Mr. Milt Allen, Scout Executive, through the medium of theatrical makeup.

4—"Here it is, gang. We Eat!!" The food rations have been found and will be brought back to camp along with the parachute, which will be used as emergency equipment (Tepee Shelter, etc.).

5—Back in camp, the Air Explorers dig into a well balanced diet of C-4 rations. Although not as tasty as their Mom's specials, these hungry lads agreed they'd scout the hills for chow like that anytime.

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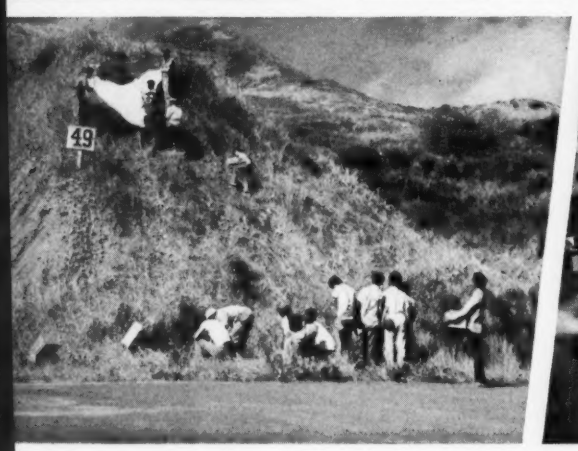


FLYING THE Thunderstorm

By the USAF Instrument Pilot School, Tyndall Air Force Base, Florida

Safe Flight Through Severe Weather Depends Upon the Ability of the Pilot to Maintain Control of the Airplane and the Ability of the Airplane to Withstand the Structural Loads Imposed

As long as man has accepted air as a transportation medium he has had to combat the weather problem. The past ten years have seen great advances in man's ability to fly, regardless of weather. These advances have been mainly in three closely allied fields of endeavor: *Development* of—

- Instrument flying equipment
- Instrument flying proficiency
- Our knowledge of the ways of weather

One of the most difficult weather phenomena with which man has had to cope, is the thunderstorm. Recently, exhaustive tests conducted jointly by interested services have revealed great quantities of highly enlightening material on the subject of thunderstorms.* (Most USAF pilots have been exposed, at least in part, to much of this information.) It is not the purpose of this article to recount or explain such data. However, since such a great amount of new, and sometimes seemingly contradictory, information concerning thunderstorms has been brought to our attention, it might be well to reiterate some of the logical conclusions which experienced instrument pilots have been able to draw from the data available.

The safe and expeditious accomplishment of all weather flight generally involves two phases—flight planning and flight technique. Let us examine the thunderstorm problem in terms of the most logical planning procedures and in-flight technique.

* See "The Thunderstorm," for sale by Superintendent of Documents, Washington, D. C.

PLANNING A FLIGHT THROUGH THUNDERSTORM AREAS

Preparation is the number one essential in cases where flight through turbulence is anticipated. Planning in this respect should start on the ground prior to takeoff. Special attention should be given to forecasts and Storm Detection Radar with the view in mind of avoiding severe thunderstorm activity. If avoidance is not possible, planning with respect to best airspeed and best altitude is essential.

The Best Airspeed

Proper airspeed is a primary factor in the safe conduct of flight through a thunderstorm. The choice of airspeed depends upon the type of aircraft. Other factors of secondary importance are the weight and balance condition of the aircraft and pilot technique. At the lower airspeed ranges, structural stress upon the aircraft is less, but controllability is sacrificed; whereas, at the higher airspeeds, controllability is better, but greater stress is imposed upon the aircraft. The best airspeeds, therefore, are a compromise between controllability and stress.

Flight that is *too* slow in a thunderstorm or in areas of turbulence may result in partial or full stalling of the aircraft. Excessive movement of the controls by the pilot in order to attain a level attitude during such flight may result in an inadvertent stall, and the possibility of getting into an unusual position. An airspeed substantially above stalling speed should be maintained. If excessive movement of the controls is necessary to maintain a level flight attitude, the airspeed must be increased until this condition is corrected.

At any rate, airspeed is a critical consideration in the thunderstorm situation. For this reason the Air Materiel Command has seen fit to publish the Thunderstorm Flyability Scale or Safe Speed Chart. This scale was printed in part in the September, 1948, issue of *Flying Safety* Magazine. It also appears in the Operating Instructions for many of our present military aircraft. A typical scale is shown in the illustration.

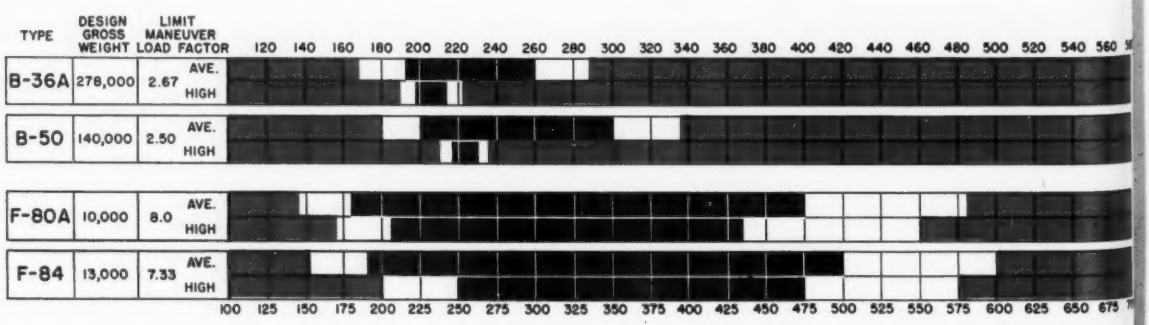
Many erroneous implications have, in the past, been drawn from the use of these charts. These implications resulted, not from any fundamental error in the charts or any fault in their presentation, but rather from faulty interpretation of the data presented.

First, let us consider a few facts regarding airspeed and load factor. Load factor is the ratio of the normal load imposed on the structure of an airplane under level flight conditions to the actual load imposed by acceleration and maneuvers. A classic example of this is the pull-out from the steep dive. The load imposed here is many times that imposed in level flight conditions. The load factor in this case would be greater than normal. Gusts in the atmosphere have the effect of causing additive load factor in much the same manner as maneuvers. Thus, we have what we may call Gust Load Factor and Maneuver Load Factor. They may be imposed simultaneously. The greater the airspeed at which a given maneuver is executed or at which a given gust is encountered the greater the load factor. Aircraft are designed to withstand a certain maximum load factor, beyond which point they are subject to permanent material "set" and structural failure.

Now, it should be evident that although the pilot has no control over the magnitude of the gusts which he encounters in the thunderstorm, he is able to maintain optimum airspeed and he is able to minimize the additive effect of maneuver load factor.

The Thunderstorm Safe Speed Chart was developed with the idea of giving the pilot some reference from which he could determine the safe range of airspeed at which the average, or the maximum observed gusts might be encountered safely. It should be noted, however, that airspeed indications have been found to be extremely erratic during thunderstorm flight and that they cannot be wholly depended upon. For this reason, the use of power settings rather than airspeed indications has been found to be more dependable in flight through thunderstorms.

Part of the proper planning for flight through turbulence involves an adequate knowledge of the power settings needed to produce a desired airspeed. The pilot should realize that the effect of gusts are directly proportional to the airspeed. A power setting should be chosen which will effect an airspeed in non-turbulent conditions which will be somewhere near the low end of the safe range on the Safe Speed Chart. It should also be noted that the Safe Speed Chart does not take maneuver load factor into consideration.



The Best Altitude

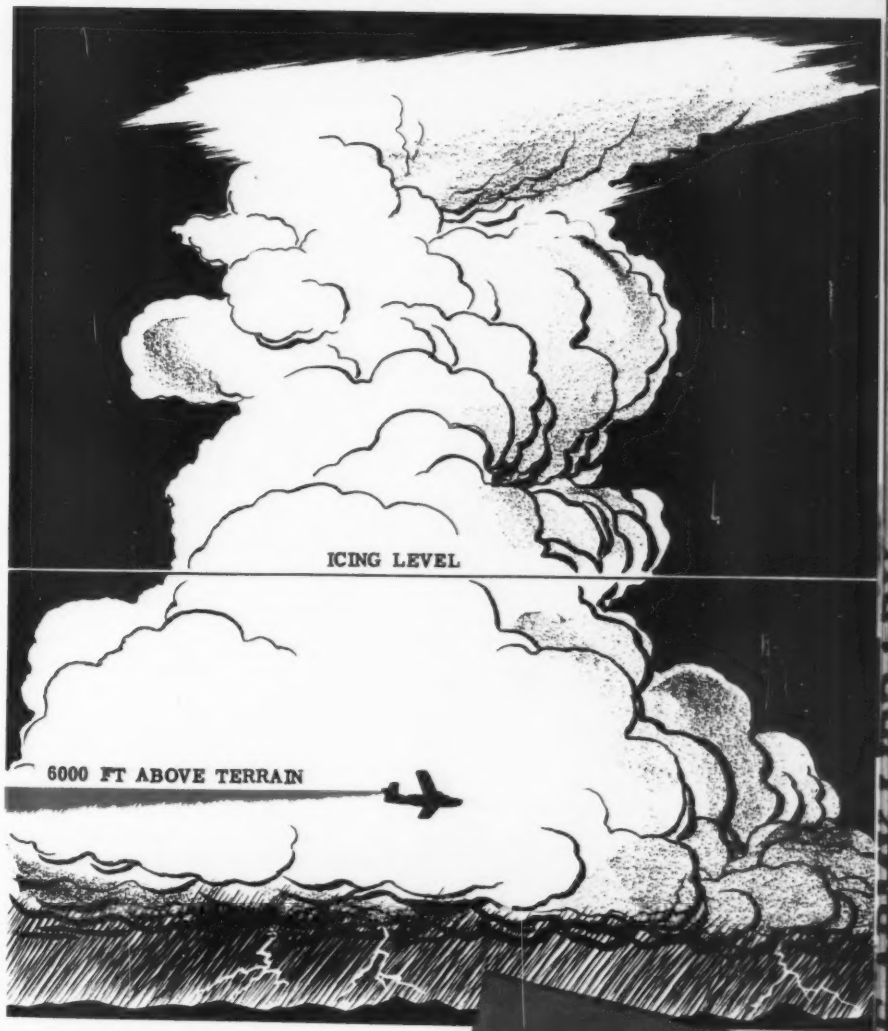
The degree of turbulence is dependent upon the intensity of any single gust, and the sequence, spacing and intensity of all gusts encountered. The greatest frequency of severe turbulence is found in the middle levels of the thunderstorm (i.e. 10,000 - 25,000 feet above terrain). Keeping in mind the minimum safe altitude necessary to clear all the terrain and obstacles, the lower altitudes should be chosen, if practical, when flying through a thunderstorm. Therefore, it seems that a logical optimum altitude would be about 6,000 feet above the average surrounding terrain.

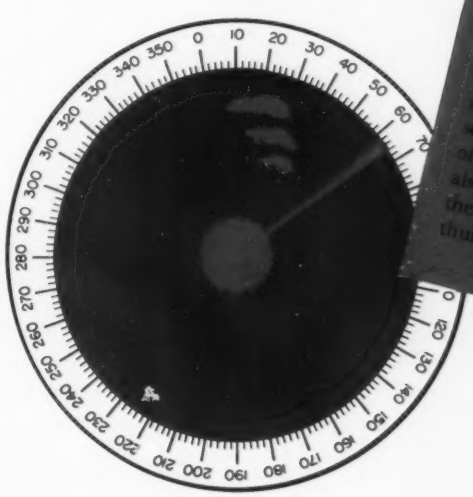
The roll cloud, which is undeserving of its reputation for containing severe turbulence, is found near the 6,000-foot level, and at this altitude, turbulence is not frequently severe. Severe turbulence may be found at any altitude if the right conditions exist; however, at the lower altitudes all gusts occur less frequently. The icing level is also important in selecting an altitude for flying through a thunderstorm. Icing can be quite severe if the large droplets common to such unstable phenomena exist in the supercooled state.

After selecting the best altitude, it is necessary to determine the maximum and minimum altitudes at which corrective action will be taken.

Storm Detection Radar

Most Air Force base weather stations now have Storm Detection Radar equipment available for pilot assistance in flight planning in regions of thunderstorm activity. Information regarding availability of this equipment may be found in the Radio Facility Chart. Areas of intense storm activity are clearly delineated and rate of movement is readily discerned, making it possible to choose a flight path which will avoid the regions of greatest turbulence. Storm Detection Radar may be used prior to flight or may be used in flight by contacting Military Airways at bases where Storm Detection Radar is available.





Planning Inflight

During flight, the pilot is duly forewarned of possible encounters with thunderstorm activity by the presence of excessive radio crash static, and in addition at night, by the observation of lightning in the region of the flight path. Airborne radar is also extremely useful in forewarning the pilot of an approaching region of thunderstorm activity.

FLIGHT TECHNIQUES IN THUNDERSTORMS

Certainly, thunderstorm flying involves more than planning, though preflight and inflight planning are prime essentials. Basically, planning involves the determination of the possibility of avoidance of thunderstorms, for this is by far the best choice if the mission allows. Where avoidance is not possible, planning involves the selection of optimum conditions so as to minimize the effect of the attendant hazards. Where the mission does require the accomplishment of flight through thunderstorms we must consider a second phase: flight technique.

● *ATTITUDE* — Maintenance of level flight attitude is the primary concern during actual thunderstorm penetration. Control technique is the key to this problem. Attitude control involves proper control of pitch, bank and power.

● *PITCH CONTROL* — During thunderstorm penetration, the artificial horizon is always the primary pitch instrument in level flight. It is used to maintain a constant level pitch attitude. Any deviation in the indications of the artificial horizon from the level attitude must be corrected to the original value *by using smooth, steady control pressures.* This can be done by observing the rate of movement of the reference airplane on the instrument in relation to the horizon bar when making a pitch correction. The limits of the artificial horizon for pitch are 70° above or below the horizon. In no case has this instrument been known to tumble because of the effects of turbulence in a thunderstorm when sufficient airspeed was maintained to allow good controllability.

● *BANK CONTROL*—The artificial horizon, in addition to being used as the primary pitch instrument, is also used as the primary banking instrument. Any change in the banking attitude is corrected smoothly by keeping the wings of the miniature aircraft level with the horizon bar. When a gust strikes a wing of the aircraft and causes a bank, aileron control is not applied abruptly against the effective gust. The aircraft is allowed to ride with the gust until its effectiveness is diminished, and then the correction is made by smooth, steady control pressures.

A change of heading, resulting from a gust or gusts, should be corrected back to the original heading by using a minimum amount of bank. This is done by continually correcting toward the original heading, using coordinated control pressures, and cross-checking rapidly between the directional gyro and the artificial horizon. To check the proper operation of the gyros, the turn-and-bank indicator is cross-checked occasionally against the directional gyro and the artificial horizon.

● *POWER CONTROL* — A constant power setting and a constant attitude should be maintained unless the airspeed falls off to 60 per cent above power-on stalling speed or increases to approximately 30 per cent above penetration airspeed for the particular aircraft being flown. For example, for a given aircraft a penetration airspeed of 200 mph IAS is used. The aircraft's stalling airspeed (power-on) is 100 mph IAS. The maximum value the airspeed is allowed to attain before reducing the manifold pressure is 260 mph IAS. The minimum value to which the airspeed is allowed to fall before increasing the manifold pressure is 160 mph IAS. This information is shown graphically on the AMC Thunderstorm Safe Speed Chart.

The airspeed indicator, because of rapid changes in horizontal gust velocity found within thunderstorms and/or heavy rain clogging the pitot tube, may fluctuate as much as 70 mph momentarily. For this reason, the airspeed indicator is not used as a pitch instrument, but is brought into the cross-check to determine the need for a change in power. If the airspeed increases to the predetermined maximum at which a power correction is necessary (from consulting previously mentioned AMC Safe Speed Chart), the airspeed indicator, in addition to the manifold pressure gage, is used as a guide to ascertain the proper power adjustment. With a decrease in airspeed the same principles of correction are applicable. When changing the airspeed during a constant pitch attitude the manifold pressure is first adjusted to the new setting. After the airspeed has changed to the desired value, the manifold pressure is set at the point which will hold the new airspeed.

Airspeed values may be roughly approximated during turbulent conditions by considering the pitch attitude and manifold pressure relationship. The principle of this relationship is that for any specific manifold pressure and pitch attitude combination there will be only one resultant airspeed. The use of this principle might become necessary during extremely heavy rain, icing of the pitot system, or extreme fluctuations of the airspeed indications caused from instrument panel vibration or gusts. If an aircraft is icing up externally, manifold pressures must be higher in order to attain the same airspeed.

● *ALTITUDE CORRECTIONS* The violent thunderstorm encountered in flight presents a situation which may well be considered an emergency. Within the immediate influence of an active thunderstorm cell, attitude and directional control are the primary concern. Altitude *must be allowed to vary* as the aircraft "rides out" the storm in order to minimize the effects of turbulence. The only deviation from such procedure would be the necessity for maintaining safe altitude above surrounding terrain.

In the event that it becomes necessary to correct for altitude a minimum pitch correction should be made. The actual amount of movement of the miniature aircraft above or below the horizon bar on the artificial horizon is dependent upon the airspeed, but should always be held to a minimum.

Jet aircraft, because of their high speed, are especially sensitive in this respect and require special effort to avoid over-control. One-eighth of an inch movement of the miniature aircraft, while flying at 400 mph will cause a rate of climb or descent in excess of 2,000 feet per minute. Above all, be cognizant of the effect of maneuver load factor and act accordingly. Major altitude corrections may be executed with the greatest degree of safety in the relatively smooth flying area outside of the influence of the individual thunderstorm cell.

Downdrafts Near the Ground

Tests have shown that the possibility of the downdraft carrying the aircraft dangerously close to the ground is not as probable as might first appear. At least this is so in the case of relatively level terrain. The downdraft begins to assume a horizontal component at about the 2,000-foot level and offers a cushioning effect. Nevertheless, a good margin of safety should be maintained at all times. It should be noted that mountainous terrain offers a greater problem in this respect. Thus, the amount of terrain clearance required varies, depending upon terrain, but lower levels are recommended from the standpoint of thunderstorm hazards, if the thunderstorm can't be overflown or avoided.

Hail

Hail cannot be forecast to occur at any specific time or place; it is usually encountered without warning. There is no basis for the erroneous belief that certain areas in a thunderstorm contain hail because of some color such as green, yellow, etc. Light rays may be refracted by water, crystals, vapor and snow, causing various color combinations.

Most hail can be flown through without danger to a metal-covered aircraft. Small hail, which is most prevalent, smashes itself when it strikes the aircraft and is sometimes mistaken for sleet. Larger hail encountered at any airspeed will normally dent the leading edges of the wings and empennage, as well as the nose section and propeller hub. In rare instances, hail has been known to break the windshield and penetrate the metal skin of an aircraft. However, it is not known to have been recorded that hail has ever caused complete structural failure. Aircraft have been rendered unfit for further use because of the effects of hail, but they were always able to continue and make a safe landing.

When hail is encountered, it may be going up, suspended by drafts, or falling; so a change of altitude is not logical. Hail areas are small so that the course should not be changed, but a reduction in airspeed, if not already accomplished, should be made immediately in order to reduce the danger of structural damage.

A feature article on hailstorms as hazards to flight, prepared by Air Weather Service, will be published in Flying Safety *next month.*

Landing

A storm in the vicinity of an airport will be accompanied by high velocity surface winds, abrupt wind shifts and rapid pressure changes. Therefore, during this time landings should be avoided wherever possible, bearing in mind that the thunderstorm is a fast moving phenomenon and does not generally persist in a given locality for more than a short interval. Landings and takeoffs during the time that the thunderstorm is overhead is especially hazardous because of the effect of strong surface winds at low airspeeds close to the ground. Moreover, the effect of rapid pressure changes on altimeter readings makes low visibility approaches extremely inadvisable under such conditions.

In the event that extremely heavy rain and severe turbulence are encountered while on final approach, do not land. Pull up, and follow the missed approach procedure. By the time that a new approach can be effected, the region of intense activity will have moved from the immediate vicinity of the landing area. Before landing, recheck the altimeter setting, wind speed and wind direction.

All-Weather Proficiency

The thunderstorm, like all other adverse weather phenomena, does present a significant deterrent to the progress toward the all-weather-flying goal which our Air Force must achieve.

We have two basic approaches by which we may attack the thunderstorm problem and help attain our goal.

First, whenever the mission permits, we can and should use every means at our disposal to avoid areas of extreme thunderstorm activity in flight. Forecasts, pilot reports, storm detection radar and airborne radar equipment are some of the available means of obtaining data from which we can plan to *avoid thunderstorm activity.*

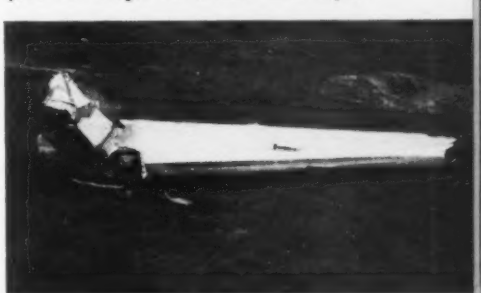
Secondly, if penetration of regions of severe thunderstorm activity becomes inevitable, we should choose optimum conditions from those over which we have control. By selection of proper airspeed, power settings, and altitude, and by the development of the correct control technique, we can certainly minimize the hazardous effects of the thunderstorm.

With the proper combination of planning and technique the problems presented by the thunderstorm should not materially hamper the attainment of a very high degree of all-weather proficiency.

Whenever the mission permits, thunderstorms should be avoided. These three photos show the wreckage of a B-25 which dove out of a severe thunderstorm over the Western Plains, shedding its left wing, tail and nose section. The pilot, holder of a . . .

. . . green instrument card had requested 7,000 feet through air mass build-ups along an airway, but because of traffic, was cleared at 10,000 feet. Moments ahead of him, an airliner flew through broken clouds at 8,000 feet, detoured by 10 miles . . .

. . . "as mean looking a thunderstorm" as its pilot ever had seen. The higher flying B-25 in the soup, apparently flew into this same storm, encountered violent gusts beyond its design. All aboard were killed.



THINGS TO REMEMBER

In cases where thunderstorm penetration is anticipated, the following procedure should be followed:

1. Turn pitot heat ON.
2. Turn the autopilot OFF (or turn altitude control OFF).
3. Increase propeller RPM to maintain engine temperatures, get quicker reaction from power changes, and obtain some additional gyroscopic stability.
4. Tighten and check safety belts. (Crew and passengers.)
5. Apply carburetor heat, if required.
6. Check gyros for proper setting and operation.
7. Turn up cockpit lighting to full intensity to minimize the blinding effect of lightning. Where white lights are available, they should be used.
8. Check the proper operation of de-icing equipment. Turn on anti-icing equipment in cases where free-air temperature is below zero degrees Centigrade.
9. Landing gear and flaps retracted to avoid loss of aerodynamic efficiency.
10. Adjust power settings for desired airspeed.
11. Climb or descend to desired altitude (subject to prior ATC approval).
12. Accurately fix position prior to actual entry into area of thunderstorm activity.

AIRBORNE RADAR

The use of radar for inflight storm detection has long been practiced with a high degree of success by pilots whose aircraft are equipped with radar. This procedure is instrumental in eliminating the aspect of anticipation which generally accompanies flight through thunderstorm areas. The psychological effect of a prior knowledge of thunderstorm magnitude and location on the part of the pilot reduces the tenseness of such a situation to the extent that the more relaxed, confident pilot does not fall victim to the common tendency toward over-control often resorted to in the excessive turbulence situation.

The radar echo is the reflection of the heavy moisture area in the rainstorm. Exhaustive tests show a definite positive correlation between heavy rain and heavy turbulence. This means that although radar will not guarantee avoidance of all turbulence, it will materially reduce the frequency and magnitude of heavy gusts encountered if echoes are avoided by at least two miles. Gusts encountered within the radar echo have been found to be four to five times greater than the gust velocity outside of the two-mile range. Radar takes the associated stratus and stratocumulus clouds out of the thunderstorm picture and opens up the big ones to plain view.

FORMATION OF THUNDERSTORMS

Thunderstorms have their origin in cumulus cloud. As the air becomes unstable, the atmosphere attempts to regain its balance and re-establish a stable condition. The greater the instability the more forceful is the over-turning required to return the atmosphere to equilibrium and increased amounts of cumulus and cumulo-nimbus are formed. A thunderstorm is the most violent manifestation of this over-turning in the atmosphere's struggle for stability. Each thunderstorm contains cells having a life cycle of between two and three hours and varying from one to five miles in diameter. These cells may be in any stage of development, but the majority in a storm are either at the peak, or dissipating stages. The cells are the areas of greatest turbulence, and the air between them, up to a mile and a half in width, normally offers a comparatively less intensity of turbulence, although severe turbulence has been experienced on occasions in these in-between areas. The tops of thunderstorms may be as low as 10,000 feet in temperate latitudes, but are usually very much higher, with thunder clouds sometimes extending to 60,000 feet in low latitudes.

Along with newly designed flying clothing from AMC, which is being tested at the same time as the Stratojet, Col. Paul W. Tibbets, WIBAC Project Officer, wears a helmet "built" from a plastic pattern previously molded to his head.

HARD HAT EVOLUTION

IN DAYS OF aviation's yore when a lot of "flying machine" hard landings seemed to be the rule rather than the exception, a goodly number of daring young men went forever into the wild blue yonder for the simple reason that they were literally tossed onto their heads from a more or less precarious perch when "The Thing" came down to a sudden, screeching halt.

Logically, some people began to realize that if this landing technique was to be followed, the human skull needed more protection than a golfing cap and as early as 1912 a skull-saving program was launched. First, the fly boys wore the early football helmet. Then came the development of a pneumatic safety-helmet, which resembled the Hard Hats of today. Then there followed several crash landings wherein the pilots landed on their noggins, picked themselves up, albeit groggily, and staggered away from the wreck. The evolution of the hard hat was under way.

Now, 39 years later, the Hard Hat is still having its ups and downs, so to speak, and the USAF has boiled the skull-protection problem down to two helmets: The familiar P-1A, and the Toptex, which is appearing here and there. The P-1A is a development of the Clothing and Equipment Branch of the AeroMed Lab and first saw service sometime in 1946. Designated the P-1, the helmet was later modified into the P-1A.

The Toptex helmet is an outgrowth of work started originally to find better protection for football players and subsequently led to the development of the present helmet.

Both helmets offer the best available protection today for USAF pilots, but the big problem is for still further improvements, not only in the evolution of Hard Hats, but for other protective clothing and flying gear, as well. Safety research continues to seek better materials —for the ultimate in shock absorbing principles applicable to protective helmets. Meanwhile, for the best in safety, today's pilots must continue to pay close attention to correct fittings and proper adjustments of the Hard Hats—which can save a headache or a life.

The first "Hard Hat," a pneumatic helmet, was developed around 1912 "when pilots often lit on their heads" in landing crashes.

No, he hasn't been scalped, Lt. Col. Richard C. Neeley, ATRC Liaison Officer at Project WIBAC (B-47 service test), has a warm softened plastic shell molded to his head for a custom fitting of a Toptex protective helmet. When fitted, the shell is hardened by cooling, measured and sent to the helmet company as a mold from which a "hard hat" will be made.

TO SAVE LIVES

Personal Equipment Specialists are Trained at Chanute AFB to Help Air Crews Survive Emergencies

By Capt. Donald E. McCulloch, Flying Safety Officer and Vernon Martin, Chief Instructor
Personal Equipment School, Chanute AFB, Illinois

A USAF BOMBER droned under murky clouds, low over the Pacific, its crew occupied by their various duties. Suddenly the steady pulsations of the engines were interrupted by a loud explosion. Fire streamed back from the nacelle of the No. 3 engine, and attempts by the crew to extinguish the blaze were fruitless. As the fire grew in intensity, there was no confusion because each crewman was well versed in his particular duties under emergency conditions. In the ensuing minutes, proper use of personal equipment saved all aboard. The plane was ditched, and every man accounted for in the life rafts.

This could have been another story, "Bomber disappears—all aboard believed lost," had the crew not properly utilized the equipment provided for such emergencies, or had the equipment been improperly maintained.

Best utilization of life saving equipment is assured by having trained personnel at every Air Force installation to brief air crews on the how and when and why of emergency equipment. The men and women who deal in survival gear are known at every base as personal equipment technicians. They are the people who periodically inspect and pack parachutes—the one-way elevator which must be ever ready to bring an airman safely back to earth to live and to fly again.

Parachutes, important as they are, however, are only one part of the stock of life-saving equipment which the personal equipment technician handles. When a parachute brings a man down to soft ground near a town or a farm house, his worries may be over. But, unfortunately, emergency jumps are not made over picked locations. When the time to "hit the silk" arrives, there is no choice as to where to jump. But fortunately, there have been untold hours of preparation for survival which is sequel to a jump.

Personal equipment technicians have inspected and packed life rafts for over-water flights. They have stocked these rafts with emergency food provisions, signal equipment, equipment for converting ocean water into drinking water, and booklets of reminders to help survivors remain survivors.

Flights over wasteland areas are outfitted with the special equipment that may be necessary to help keep a man alive and to start him on his way back to civilization and home. Special tents, special saws for building snow houses, instructions as to the best kind of native food in the area, carefully designed emergency clothing —all these and more fall within the province of the personal equipment specialist. It is his job and mission to provide flight crews with the equipment they might need, and to thoroughly indoctrinate the men whom he serves in the efficient use of this equipment.

No less important, and more frequently used, is the oxygen mask and bail-out equipment which make reality out of the dreams of years ago for survival at high altitudes.

The knowledge which personal equipment specialists must have is wide. Their technical skills must be deeply ingrained. Their sense of responsibility must be sincere —for these men can never say, "Bring it back for a new one if it doesn't work." It's got to work—*every time.*

The know-how to make everything work every time begins at Chanute Air Force Base, grand daddy of all Air Force technical schools. As early as 1919, shortly after the first man-carrying parachutes proved their life-

Proper fit is not only a matter of comfort, it also means survival. Trainees learn to fit and test oxygen equipment.

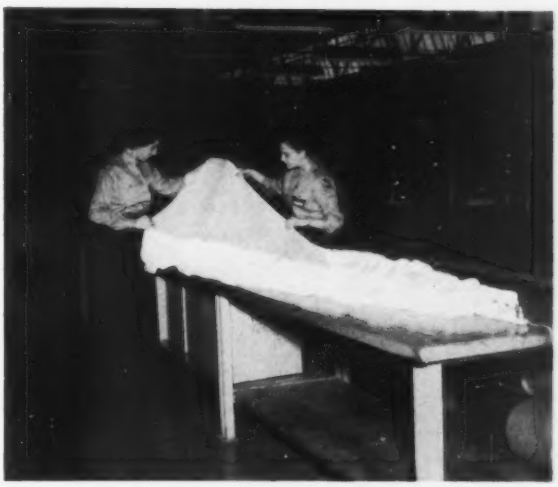
saving capabilities, a school was established at Chanute to train riggers in the intricacies of inspection and maintenance of this equipment. Students packed and serviced the parachutes, and then, as a final test of their proficiency, performed actual jumps. In 1939 the first regiment of men and officers were trained at Chanute to become the nucleus of the Paratrooper School at Ft. Benning.

During the expansion of the Air Force, prior to and during World War II, many other life-saving devices were introduced into the personal equipment program. As such items as life rafts, the "Mae West," cargo and aerial delivery type parachutes, and innumerable items of clothing and survival equipment made their appearance, the School at Chanute was expanded.

The School now has three phases of instruction with complete training for qualification in MOS 609 (Leather and Canvas Technician), MOS 620 (Parachute Technician), and MOS 594 (Personal Equipment Technician). The graduate is qualified in any one of these military specialties. To qualify, the student has maintained flying clothing; inspected, packed, and maintained man-carrying, aerial delivery, cargo, and deceleration type parachutes; inspected and serviced life rafts and vests; fitted, tested, and serviced oxygen kits; inspected and maintained electrically-heated flying clothing and anti-G suits, has been indoctrinated in survival and has been taught briefing procedures for all personal equipment and its use.

The extent to which the skills of these trained technicians are utilized by units to which they subsequently are assigned, measures the success of the program. Not only are these skills designed to save lives in case of emergencies, but also contribute to the efficiency of routine flights.

Chanute AFB trainees learn the dual method of packing parachutes (above) and how to perform periodic inspections (below).



Parachute packers don't have to jump-test their own handiwork as in by-gone years. Now, they fit a dummy for drop testing.

A life raft requires maintenance and inspection — it must inflate quickly and contain proper food and gear for survival.

CAN YOU READ THE ALTIMETER?

Errors in Interpreting this Instrument May Be the Cause of Those Mysterious Collisions With Mountain Peaks

By WALTER F. GRETHER
Chief, Psychological Branch Aero-Medical Laboratory

YOUR ALTIMETER is an important instrument, and one which deserves your most careful attention. Not only is care required in putting in the correct barometric pressure setting, but you must be on guard particularly against misreading the instrument. The dangers of misreading the altimeter came out clearly in a series of studies carried out by the USAF Aero Medical Laboratory at Wright-Patterson Air Force Base.

Two investigators, Fitts and Jones, asked several hundred pilots to tell about accidents or near accidents resulting from misreading of instruments. From these verbatim pilots' reports many helpful leads were obtained about how aircraft instruments can be improved. One of the most surprising and significant findings, in adding up the results, was the number of pilots who reported difficulties in reading the altimeter. In fact, more pilots reported difficulty in reading the altimeter than any other instrument.

The following pilots' reports are typical:

"It was an extremely dark night. My co-pilot was at the controls. I gave him instructions to take the plane, a B-25, into the traffic pattern and land. He began letting down from an altitude of 4,000 feet. At 1,000 feet above the ground, I expected him to level off. Instead, he kept right on letting down until I finally had to take over. His trouble was that he had misread the altimeter by 1,000 feet. This incident might seem extremely stupid, but it was not the first time that I have seen it happen. Pilots are pushing up plenty of daisies today because they read their altimeter wrong while letting down on dark nights."

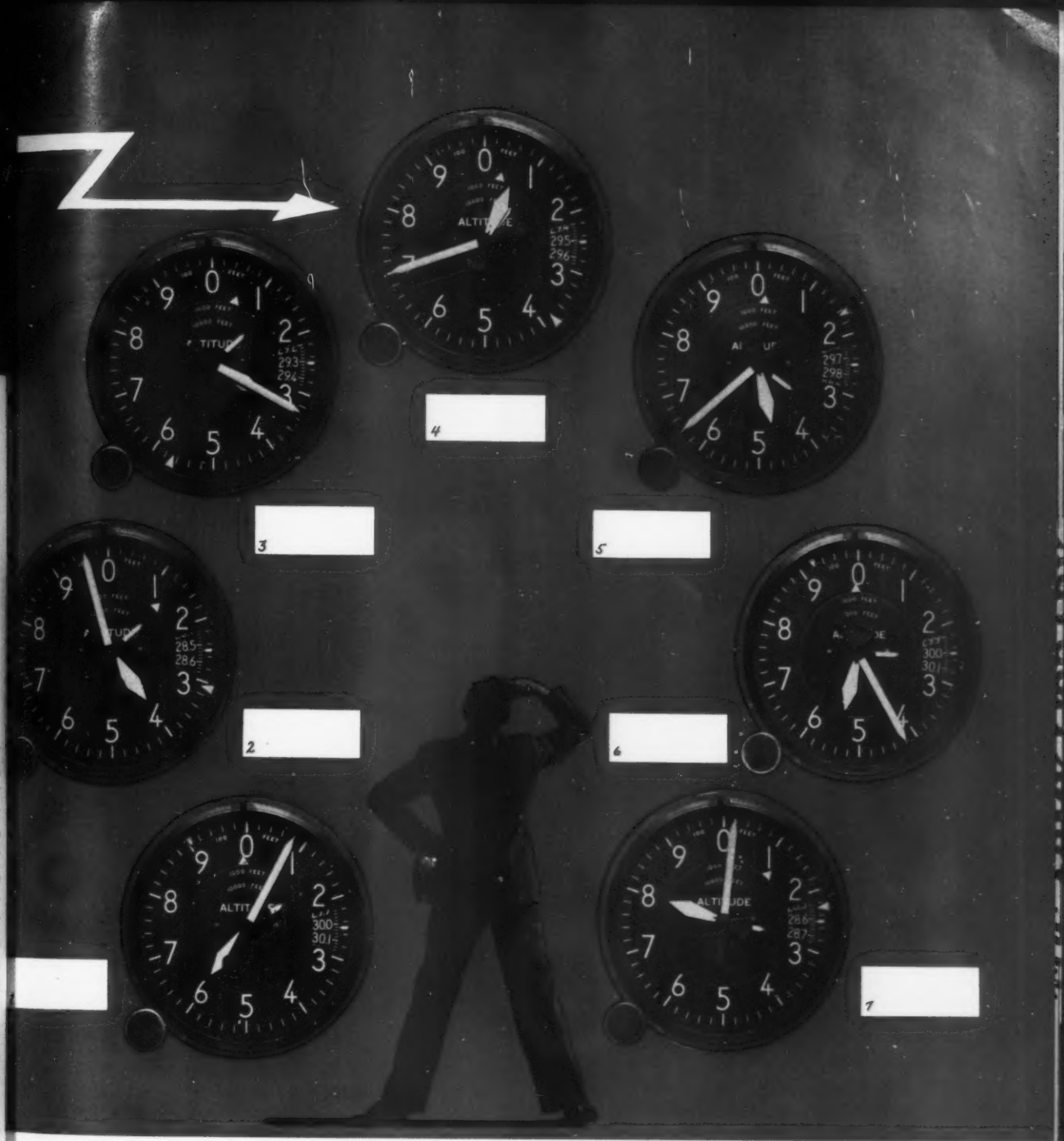
"A pilot of my bomber group was making practice night landings in a B-29. The traffic pattern was to be 2,500 feet. The field elevation was 1,000 feet. The pilot misread the altimeter and was actually 1,000 feet lower on his traffic pattern than he thought he was. He went through his landing procedure, had his wheels down, flaps 30°, and was on his final approach. Before he realized what had happened, he flew into the ground about one and one-half miles short of the runway. Luckily he hit in an open field, bounced, and managed to maintain flying speed. The main gear withstood the impact, but the nosewheel was ruined. By expert piloting, he made a safe landing and averted what could easily have been a disaster."

It will be noted that in both cases the pilot was exactly 1,000 feet lower than he thought. In other words, he read the altimeter 1,000 feet too high. In this study all the pilots lived to tell about their errors, but in how many similar cases were the pilots less fortunate? To this question we have no good answer, but almost any one of the cases in this study could have had the all too familiar ending—collision with the ground, cause unknown. Flight plans call for 1,000-foot clearance over the highest terrain en route (2,000 feet over mountainous areas). Under the stress of rough air and instrument conditions the pilot may read the altimeter 1,000 feet too high and reduce his terrain clearance to zero.

The 2,000-foot clearance assumed on IFR flights over mountains could be lost by a combination of misreading the altimeter 1,000 feet and by wrong altimeter settings or effect of orographic lifting on the density of the air.

If more of the facts were known, we would probably find that many of the mysterious collisions with mountain peaks, or landings short of the runway, were caused by altimeter reading errors. The Air Force has had no monopoly on this type of accident, and a number of airline crashes similarly cast suspicion on the altimeter.

On 13 June 1947, an airline DC-4 crashed near Lookout Rock, West Virginia, en route from Pittsburgh to Washington, D. C. The flight had been cleared by Airway Traffic Control for descent from 7,000 to 2,500 feet, and was to report leaving each 1,000-foot altitude level. Approximately 3 minutes after reporting leaving the



TEST YOURSELF—

Reading an altimeter ought to be as easy as telling time, but is it? Studies of the Aero Medical Laboratory show that at certain settings, the three-pointer altimeter is particularly susceptible to reading 1,000 feet too high. This is most likely to occur when the sensitive pointer is approaching zero on the scale. At higher altitudes it is not infrequent that the altimeter is misread by 10,000 feet! One pilot reported that in a descent from high altitude he took off his oxygen mask to light a cigarette when he thought he was at 13,000 feet. His lighter wouldn't work and he didn't feel right, so he looked at his altimeter again—it read 23,000 feet.

Test yourself on the actual photographs of altimeters above. Write your answers in the white blocks. Also, jot down the barometric settings. (Test idea suggested by Flying *Magazine.)*

The Answers:

1—16,080 and 30.02; 2—13,960 and 28.53;
3—13,330 and 29.31; 4—10,700 and 29.51;
5—34,640 and 29.74; 6—25,420 and 30.00;
7—28,020 and 28.62.

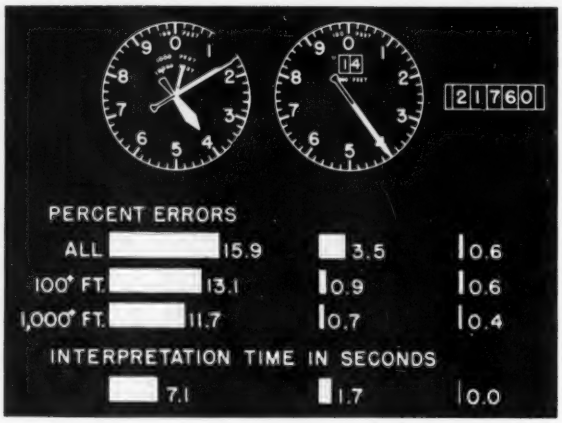


FIGURE 1

Speed and accuracy of reading altitude from three types of indicator—97 USAF pilots made 12 readings on each instrument.

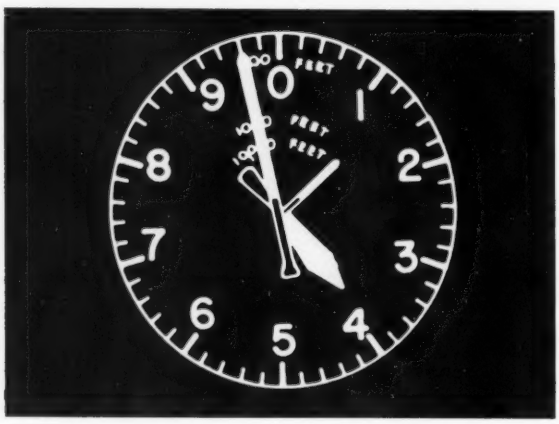


FIGURE 2

Illustration of 1,000-foot error in reading altimeter. Eleven out of 97 pilots read this setting as 14,960 feet.

3,000-foot level, with no report of having left the 2,000-foot level, the aircraft struck the mountain ridge at 1,425 feet. In all probability the pilot, who was thoroughly familiar with the route, had mistaken his altitude when he reported leaving the 3,000-foot level.

On 12 July 1949, an Airline C-46 crashed near Chatsworth, California, at an elevation of 1,890 feet, while making an instrument approach to Lockheed Airport at Burbank. The CAA Instrument Approach procedure called for an altitude of almost exactly 1,000 feet higher at this stage of the approach, and the pilot was well acquainted with the approach procedure. A 1,000-foot error in reading the altimeter provides the most plausible explanation of why the pilot descended below the authorized altitude.

A follow-up study at the Aero Medical Laboratory by the author cast further light on pilots' difficulties in reading the altimeter. Nine experimental instruments, suitable for presenting altitude, were tested. Includ was the present three-pointer altimeter. Results for USAF pilots on three of the more interesting inst ments are shown in Figure 1. It will be noted that the conventional three-pointer altimeter 11.7 per cent all readings were in error by 1,000 feet or more.

A further analysis of the data showed that at certa settings, the three-pointer altimeter is particularly su ceptible to reading 1,000 feet too high. This is mo likely to occur when the sensitive pointer is approachin zero on the scale, as shown in Figure 2. On the pa ticular setting shown, 11 out of the 97 pilots erroneous read the setting as 14,960 feet.

Why are these 1,000-foot errors made? In the fi place, the sensitive 100-foot pointer makes one revol tion for every 1,000-foot change in altitude. Therefo if only the 1,000-foot pointer is read carefully, the rea ing is likely to be off by some multiple of 1,000 fee The second source of error is illustrated in Figure 2. Th 1,000-foot pointer is pointing to the 4 on the scale, b to read the setting correctly, it must be read as 3 3,000 feet. The error comes from reading the 1,000-fo pointer to the nearest number, when it should be rea to the next lower number.

This apparently is the most hazardous type of er that pilots make in flight, particularly while letting do under instrument conditions. Some of our unexplain collisions with mountain tops could easily have happen in this way.

From still other studies by Fitts, Jones and Milto the pilots' eye movements during instrument flying, w know that pilots spend an average of about four-tent of a second each time they check their altimeter. Co pare this with the time it took for actual quantitati reading of this instrument as shown in Figure 1. Wh pilots are on instruments the hasty four-tenths-of- second look at the altimeter is not long enough to rea this complicated instrument.

As a result of these studies of errors in reading al tude, the Air Force has a new altimeter under develo ment. It will use the indicating principle of the cent instrument in Figure 1, namely a combination of a se sitive pointer and a counter. The counter gives altitu in thousands of feet. The pointer, as on the present i strument, adds the hundreds. Instead of the coun window being at the top, as in Figure 1, it will be the left side. To provide this new type of presentati a new instrument mechanism must be developed an thoroughly proven.

Until we have an improved altimeter in quantity, matter of several years at best, pilots should be on gua against the hazard of misreading the present thre pointer instrument. The greatest danger is in reading t 1,000-foot pointer too high by exactly 1,000 feet. Wh letting down on dark nights and under instrument co ditions, this error can be fatal.

TUNING TIPS

TRY THESE ON YOUR ADF

THERE IS MORE TO TUNING a radio compass than twirling the crank until the frequency number comes up.

Agreed, that's not startling news. But, on the other hand it *is* startling to find that you have been inadvertently boxing the magnetic compass for the past half hour while keeping the radio compass needle on zero.

The ADF (automatic direction finder) should be tuned carefully to get the best signal tone and positive station identification. That's the first step. After identifying the station, the function switch is placed in the COMP position, and the tuning crank is rotated to obtain maximum deflection of the tuning meter needle. The maximum deflection of the tuning needle indicates that the strongest carrier wave on the selected frequency is being received and does not indicate the best tuning for maximum readability.

If interference exists as indicated by jumbled and conflicting aural signals, use the visual signals with caution.

Remember that the tuning meter needle cannot discriminate between interference and the radio signal on the same channel. The needle indicates the direction from which the strongest signals are arriving on the frequency to which the receiver is tuned. Interference from higher powered stations operating on the same or adjacent radio channels may cause the needle to point to the direction of the vector sum of desired and interfering facilities.

For example, it may be desired to use a nearby but low power radio beacon operating on 248 kcs. After tuning in the beacon, it may be noted while rocking the tuning control from 245 to 251 kcs that strong interference exists on 248 kcs from much stronger signals emitted on 245 kcs. It may be that in this instance the strong signals on 245 kcs will appear ratiowise to the ADF tuned to 248 kcs to be somewhat stronger than the weaker signals of the closer but lower-powered station on 248 kcs. Consequently, the needle, instead of pointing to the 248 kcs facility, will strike an average of direction between 245 and 248 kcs signals—which could be hazardous if a letdown was attempted by reference to the direction indicated.

By mental evaluation of such interference, comparing the intensity of one aural signal against another while using a given volume control setting, it is possible to determine quite accurately that the desired signal is stronger or weaker than the interference. Remember that distance from the station is a controlling factor on interference. Signals from a lower powered facility reduce much more rapidly with distance away than do signals from a high powered facility. Consequently, whenever using an ADF visually, be on guard against the possibilities of adjacent channel interference giving you erroneous visual bearings. Make it a rule to carefully evaluate adjacent channel interference before using an ADF visually and be sure you know your terrain clearance on any heading before letting down.

Dual installations of radio compasses should not be simultaneously tuned to the same frequency. Interaction between their loops may result in erratic bearings on certain quadrants.

The tuning meter should always be referred to when tuning an Adcock range to make certain that the ADF is tuned to the frequency of the nondirectional center tower. The center tower is 1020 c.p.s. (1.-2 kcs) LOWER in frequency than the outer towers. After aural identification of the station, to insure the most steady visual bearings, it is well to always retune the ADF and get the maximum indication on the volume meter.

Aural bearings are subject to an 180° ambiguity, but this, of course, can be solved by the pilot and then they are more dependable and accurate than ADF bearings. Nulls can be made narrower by increasing the signal volume; conversely decreasing the volume will make the nulls broader.

Bearings taken within 30° of a coast line will indicate the aircraft nearer to the coast than it actually is.

Bearings taken during daylight are more accurate than bearings taken at night. This is because wave reflection or refraction from the stratospheric Kennedy-Heavyside layer at the frequencies involved, 100 kc-1700 kcs) is more prevalent during the hours of darkness. Caution is also advised when taking bearings one hour before to one hour after sunrise or sunset because this layer is an unusually active and changing position rapidly during this time.

GI's GUARDIAN ANGEL

Top left, two "Angels" are ready for mercy missions. Above, wounded and jump casualties await evacuation.

A NEW MERCY MACHINE, with a war potential, has come out of the Korean Theater since July, and the armed forces are still probing its warlike possibilities, for they have been far outshadowed by the machine's rescue prowess.

We are referring to the helicopter, one of the greatest practical morale-builders to come out of the war. And to the GIs and to the downed fighter pilot . . . it is their "guardian angel."

Latest available figures show that helicopters have evacuated and/or rescued over 1,200 critically-wounded United Nations personnel. The figure represents a total for the end of the year, for the Air Rescue Service of the USAF, the U. S. Navy and the Marine Corps.

The 3rd Air Rescue Squadron of the Air Rescue Service, using Sikorsky H-5 helicopters, had evacuated and/or rescued before New Year 1951, a total of 723 soldiers and pilots in Korea. The leading Air Rescue 'copter pilot has been First Lieutenant Harry C. Jeffers, of Newark, Ohio, who has personally evacuated 81 cases, and in one day he evacuated 16 soldiers.

Morale of the GI and the fighter pilot (on land and sea) is skyrocketing as they see these amazingly maneuverable "eggbeaters" flying back and forth overhead. They know, these GI's (in a terrain where maneuverability, low-flying and versatility pay off) that helicopters are evacuating wounded from the front-line fox holes; that they are rescuing small patrols, crashed jet pilots; and the young soldiers in truck convoys, going up to the front, they know these Air Rescue H-5s and Marine HO3S-1s won't leave them there . . . in case anything happens.

Road-bound ambulances, jeeps, and trucks are finding the going tough in taking troops up, and in evacuating the wounded to rear-line hospital stations. Helicopters, shuttling back and forth from combat area to rear-line stations, are filling in where the road-blocked vehicles find it impossible to do the job.

The Air Force's 3rd Air Rescue Squadron has been operating continually in Korea, and in many of the rescues, the critically-wounded might have died, but for the new mode of transportation. They have accomplished many air-sea rescues and behind-enemy-line evacuations of fighter pilots.

Several cases have been reported where craft have returned to base hospitals and it was found that North Korean bullets had pierced the whirring rotor blades. Pilots reported that they were unaware the blades had been hit until they landed.

In at least twelve cases the ARS emergency helicopters have gone behind enemy lines to pick up Air Force pilots who were forced to bail out in Red country. In these cases, ARS clearly supplied an "extension on living"—making it possible for the pilots to live and fight another day.

The air, sea, and ground forces have become highly dependent upon the Air Rescue Service, for through its aid in providing rapid and unfailing service in any circumstance of distress, regardless of location, it exists "only to save lives."

The ARS in Korea was the first service to evacuate wounded by helicopter and give blood transfusions en route to rear-station hospitals. The crew of the H includes a paratrooper medical corpsman.

The H-5H 'copter is adapted for this sort of treatment, for all litter patients are brought inside the helicopter . . . two in front with the pilot and one isolated in the rear of the plane. The wounded, needing immediate attention, are 'coptered back first, and wh

Above and top right, as wounded are loaded, another "chopper" is on way to Korean front.

The Wounded Are Brought Back Safely as Soldiers and Korean Morale Soars With Copter Mercy Missions

flying, the medical attendant in the front can administer the blood transfusions.

The helicopters of the ARS also have frequently been called upon to rush medical supplies, especially blood plasma, and on occasion have flown doctors and medical personnel men to the scene.

Among the seasoned Air Rescue pilots are Capt. Ferdinand L. Svore, who won the dubious distinction of being the first pilot to lose his 'copter when a land mine exploded under him; Lt. William Evans, Lt. Harry C. Jeffers, Lt. Myron S. Hancock, Lt. David C. McDaniel, and Lt. Merle A. Clapsaddle, who recently rescued a Marine Corps pilot on the Naktong River front.

On Christmas Eve in Korea, helicopters attached to the U. S. 8th Army Headquarters snatched 35 United Nations' personnel (all prisoners of war) from behind enemy lines. Major General Earle E. Partridge, Commander of the Fifth Air Force, made the announcement, following the rescues.

Some new ARS helicopter pilots, headed by Capt. Harry A. Copsey, of Estes Park, Colorado, made the perilous mission possible. An observation plane spotted a sign in the snow between Chorwon and Sarowon, calling for help. This is on a sector of the front north of Seoul and north of the 38th parallel.

Each helicopter made four trips to the scene, eight miles behind enemy lines. There was no report that any of the rescue planes were molested by enemy fire during the whole operation.

On the following day (Christmas Day), Captain Copsey brought a wounded Air Force ground controller to safety from the mountains of central Korea, where he had been ambushed by Communist guerrillas on the previous day.

The object of Captain Copsey's mission, Sgt. Paul H. Winner, was recovering from wounds in the right leg and shoulder. He may have died of shock and exhaustion, had it been necessary to bring him out of the mountains any other way except by helicopter. Capt. Richard B. McVay, operations officer of the Korean contingent, said that the helicopter rescue technique has been one of the most important developments of the war.

A case in which two minutes can seem like a lifetime will not soon be forgotten by a 22-year-old ensign (William Rau, USN) who had to ditch his Panther Jet in the cold Korean waters. The pilot was returning from a combat air patrol over Korea when he crashed into the sea. The USS Leyte's Sikorsky helicopter was on the job immediately. In two minutes, Ensign Rau was back on the deck. "I could hardly believe it was only two minutes," said Rau, in retrospect, "it seemed like a lifetime." Because of the weather, the helicopter pilot, Lt. Al Monohan, lifted Rau the short distance to the ship, dangling in the harness at the end of the rescue hoist.

The Navy's 'copter annals are full of such case histories of helicopter rescue at sea.

The Marines, too, can tell their tales . . . how helicopters have "brought men back to life" . . . literally. Capt. Victor Armstrong, who recently returned from Korea where he personally evacuated over 40 critically-wounded soldiers and downed airmen, said, "I have never known a time in my life when I have received such personal satisfaction from a job, as I have from bringing some of these wounded boys back to the rear lines. And this goes for the other pilots in our squadron. I can say truthfully that in every evacuation which we Marines have made—and there have been over 300—

that the wounded, lifted out by helicopters, have been brought back to life."

Armstrong himself has picked up three downed pilots behind the enemy lines, two of whom were as far as 90 miles inside the Red lines. He rescued two men behind enemy lines in the dark of night, with no helicopter lights.

"In some cases," said Armstrong, "I have loaded on poor fellows who have been so shot up that their faces were indistinguishable. I frankly didn't think they had a chance. But they pulled through. By jeep or truck over the rough Korean roads, they would have died."

There have been many individual and spectacular cases involving crashed fighter pilots. There is the case of Lt. Harold Kinison, an F-51 pilot, downed behind enemy lines in Korea, who made a spectacular run for a helicopter and made it to safety. By the time an Air Force helicopter had arrived to save him, a North Korean with a machine gun was within 10 feet of Kinison. Boldly running from his hiding spot and lighting a red flare as he ran, Kinison made the dash for the H-5, surprising the North Korean so that he failed to fire a shot. The 'copter by then was in the air and away.

In the most hazardous Marine helicopter rescue recorded to date, Capt. Gene Morrison, USMC, made his first rescue in the Korean Theater while hundreds of Chinese troops were kept at bay by fighter escort. Morrison picked up a pair of downed fighter pilots east of Chosin reservoir, where the airmen had waited three hours in the snow. Protecting fighters kept a troop of Red cavalry at bay on one side and an estimated 100 Red infantrymen away on the other. Morrison picked up his men, climbed straight upward to avoid enemy fire, and later landed his passengers safely.

The Korean War has intensified military interest in helicopters, and under plans now tentatively approved, even the Army expects to procure many transport helicopters for use by its own personnel and as integral parts of its ground units.

New tactics in amphibious assaults and ground warfare are also in the making and helicopters are expected to play a big part. The first tactical use of helicopters in combat has been an outstanding success, according to First Marine Air Wing spokesmen.

Marine helicopters first saw action over the battle front in southern Korea. They were intended to be used for artillery spotting and liaison in support of the First Provisional Marine Brigade, but it has been found that their employment in combat is practically without limit.

The Navy has used them for mine spotting, artillery spotting, plane guard duty, air-sea rescue, delivering mail to the fleet and a myriad of other uses.

Since no airstrip is required for their operation, they can land at advanced positions, aboard ships at sea, on mountain terrain, or wherever the tactical situation requires.

In a statement before the subcommittee of the House Armed Services Committee, Major General Merwin Silverthorn, USMC, said, "One of the four big lessons learned from the Korean War is that the use of the helicopter is practicable."

The present type of helicopter being used in Korea is the military modification of the commercial Sikorsky S-51, a three-passenger craft, which for all the purposes now desired by the military is grossly inadequate. However, already in production for the Air Force, the Marine Corps and the Navy is the 10-place Sikorsky H-19

The mechs always seem to work under adverse field conditions. Here, a crew chief begins to remove frost from the helicopter.

Capt. John B. Shumate, who is a medical technician, and the pilot, Lt. Harry C. Jeffers are typical working team in Korea.

(Air Force designation). And even bigger helicopters are in the mock-up stage.

Marine airmen are particularly anxious that troop carriers and assault helicopters of a larger capacity be made available as soon as possible.

One Marine Wing commander has made this recommendation: "Even at this early date and with very limited experience, many ground officers in this area are beginning to foresee the myriad of tactical situations in which a helicopter could be successfully employed.

"It is strongly recommended that training and planning in the ship-to-shore movement by helicopter be continued and that, in addition, the employment of the helicopter after the initial landing be given much consideration."

Even the men who build the H-5 helicopters used by MATS' Third Air Rescue Squadron in Korea are amazed at what the versatile "choppers" can and will do.

"Korea was the first time the helicopters had really been tried," says Harold Nachlin, Sikorsky technical representative of Bridgeport, Connecticut. "There was some helicopter operation at the end of World War II, such as with Merrill's Marauders in Burma, and at Okinawa and Saipan, but never under combat conditions.

"Helicopters were never designed to go into enemy fire," he continued. "They don't have any armor or self-sealing gas tanks. We've all been surprised at the ruggedness of the blades of the main rotors. We've had quite a few return to base, with hits. We've even had a chopper get hit just above the engine, without knocking it out. The heavy clutch stopped the bullet.

"The Marines and the Rescue Squadron use their 'choppers' differently. The Marines use them chiefly for tactical purposes. They move whole command posts by helicopter. But the Air Rescue pilots come down into enemy territory to pick up downed pilots or UN troopers cut off or surrounded by Commies.

"Everything about the helicopters will have to be re-evaluated," Nachlin said. "Our biggest problem now is parts and supply—there just aren't enough chopper parts available to send where they are needed. But, it has been very interesting to see how the higher echelons have been coming in to find out the 'whats' and 'whys' of chopper operation. The generals and admirals are concerned about the helicopter. I guess it has sold itself in the Korean fighting."

Current recommendations are for present helicopters and all future helicopters to be equipped with metal rotor blades and self-sealing gasoline tanks. The helicopter's only armor in the Korean fight has been in the element of surprise coupled with extremely low flying. There have been many instances of pilots returning with bullet holes in the rotor blades. But this seemed to make little or no difference. However, protection is needed around the underbelly or gas tank section.

Helicopters have been used before by the military for rescue work of pilots downed at sea, or in wooded or otherwise inaccessible areas, but never under the conditions they meet in Korea. They are proving themselves as valuable weapons in the Red area; they have passed their first big test.

But more important, they are saving lives.

And as Lt. Gustave Lueddeke, Marine 'copter pilot, put it: "One of the greatest contributions these things have made in war, is to morale. Every kid down there knows that no matter what happens, we will get him out if he gets hit."

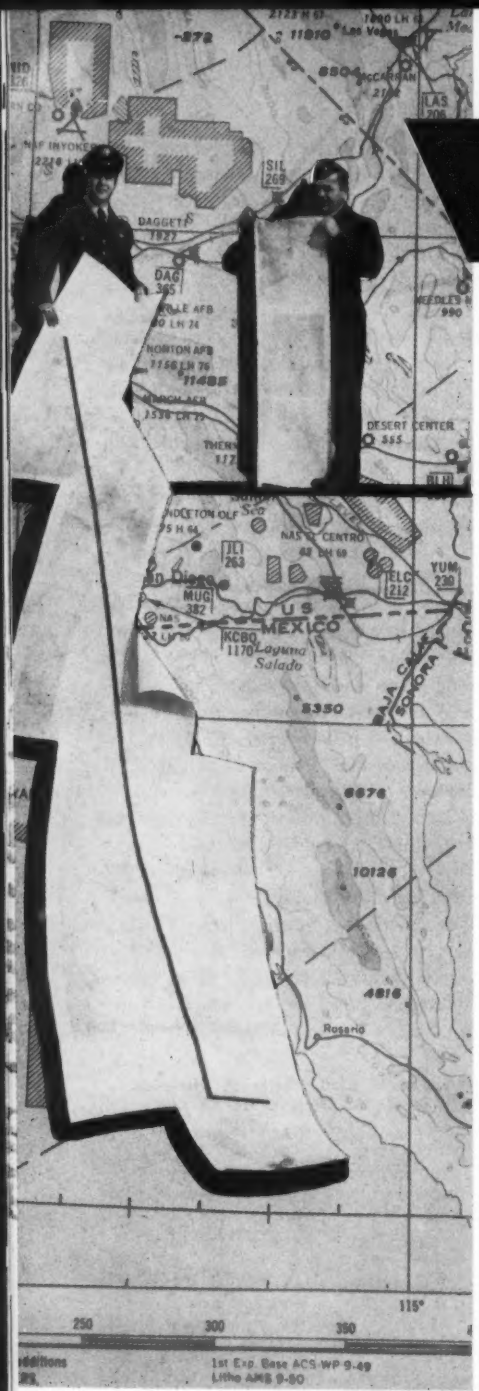
A 3rd ARS helicopter lands at the Korean front to pick up a wounded G.I. Minutes later they were off to a hospital.

Wounded Marine is strapped in carrier attached alongside a Marine Corps 'Copter for a quick trip to a rear hospital.

CHARTS FOR JETS

There is No Room or Time for Stacks of Maps in the Cockpit of a Jet

By DONALD Q. PALMER
Hq. AERONAUTICAL CHART SERVICE



The home-made strip chart on the left, of WAC charts pasted together, would take you from San Diego to Presque Isle, but there wouldn't be room for you and the 17-foot strip in the cockpit of a jet. Three of the new jet charts span the northern part of the United States and three the southern. Where 40 WAC charts are required, six jet charts do the job, and the jet pilot is not confused by data which he has no time to read. Reverse side of new charts provides airways and radio information.

"GIVE A MAN A HORSE he can ride," says the old song. In the Air Force it's "Give a man a plane he can fly." But, there's more to it: "Give him the charts that help him to fly." And more, "The right kind of charts for the type of plane that he flies."

If he pilots a jet, he doesn't want the navigation and the instrument approach and letdown charts that the slower, lower-flying aircraft can use profitably. He wants and needs tools of quite a different sort. Providing them is one of the big jobs of the Air Materiel Command's Aeronautical Chart Service.

Today, when a new, experimental series of jet navigation charts enables a pilot to navigate the breadth of the United States with only three of them, let's look back at the way it used to be.

There was, for example, the case of the B-47 that flew from Moses Lake, Washington, to Andrews Air Force Base a couple of years ago, with a home-made strip chart which was approximately 16 feet long. Learning of this "marathon" chart, representatives of the Aeronautical Chart Service interviewed the pilot and prepared a "pre-navigated" chart covering the same route for the return flight. It was only 37 inches long. Check points, times and distances were indexed at the top and bottom, and, in order to confirm ground positions, actual photographs were affixed to the chart near the check point information. The return trip proved the chart useful, but its important limitation was that it could not be used if the pilot changed his course.

Then there was the flight of the B-45 from the Los Angeles area to Langley Air Force Base, Virginia. It flew at 38,000 feet, an altitude at which a B-45 approaches very closely to mach limitations in airspeed. There were updrafts and the plane, placed on automatic pilot, several times dived back to the desired altitude, but in so doing exceeded the mach limitations. So it was necessary to disengage the automatic pilot to prevent damage to the aircraft. That was normal procedure, but there were complications because of the charts being used for navigation.

They were World Aeronautical Charts (WAC) at a scale of 1:1,000,000. A stack of them was required for the transcontinental flight, and the plane was flying so fast that it covered each chart in what seemed no time at all. Much of the pilot's time was occupied in removing the charts from the chart case and in replacing them. Every time he disengaged the automatic pilot he dropped the charts. They had to be picked up again, folded and unfolded, and the WACs are large charts.

Such a condition could scarcely be called conducive to the best and safest flying. The Aeronautical Chart Service recognized from the beginning that navigation charts and arrival and letdown charts must be specially produced to meet the unusual conditions found in jet aviation. It was clear that only the right tools for the job could make for efficiency and safety. Study and experimentation, accomplished in close coordination with the major jet commands and with operational jet units, have resulted in significant advances in jet charts, although the perfect chart is naturally a goal not as yet attained.

It had long been apparent that several factors were involved. Jet charts must be small in size because of the limited cockpit space, especially in the fighters. Navigation charts must show the ground information which the pilot actually needs, neither more nor less. The jet pilot, flying at great speeds and altitudes, does not need and cannot see some of the detailed terrain features useful to the navigation of conventional planes. Letdown procedures, so different from those of slower aircraft, must be specially depicted on charts for aircraft which, due to tremendous fuel consumption at low altitudes, cannot wait around in the air before making their landings.

Charts smaller both in scale and in size appeared as the likely answer. In July, 1949, two officers of the Aeronautical Chart Service tried an experiment. Flying in a B-25 from Los Angeles to Washington, D.C., they decided to navigate with a very small scale chart, a 1:5,000,000 planning chart which was not intended for navigation. The trip was successfully made, and it was at once realized that if a B-25, slow and low-flying by jet standards, could navigate with the scantier detail of a planning chart, jet aircraft certainly could.

Work on the new chart was begun, and last November a series of six experimental jet navigation charts at a scale of 1:4,377,740, or exactly one inch to 60 nautical miles, covering the entire continental United States, was issued. Three of them span the northern half of the country and three the southern. Only three, as against 13 WACs, are required for a flight from San Diego, California, to Presque Isle, Maine, or three, as compared with eight WACs, for a trip from San Francisco to Washington, D.C. More than 40 WAC charts are required to cover continental United States.

Not only the small number but also the small size of these charts is a favorable factor. They are only 15½ by 18½, as compared with the approximate 29 by 22-inch size of the WAC charts.

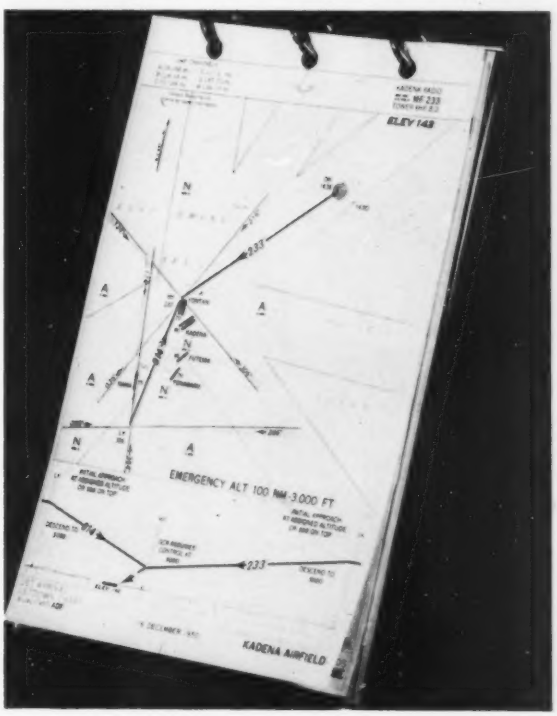
The jet pilot, studying the new charts, is spared the task of poring over detail he doesn't need. He is not confused by data which he has no time to read and which would only spell clutter to him. Conversely, he does have the information he requires. Military aerodromes (with runway patterns shown), powerful radio stations, easily identifiable cities, rivers, lakes, trunk railroad lines, super-highways and the like are emphasized. Hamlets, small streams, unimportant roads, airfields not usable by jets, etc., are not shown. These charts present a "picture pattern," the effort being to depict the earth's surface as nearly as possible as the jet pilot would see it. Color is employed in such a way as to show general ground masses rather than details. Gradient tints and spot elevations inform the pilot of altitudes.

A revolutionary feature of these charts is the reverse side, where airways and all the radio information required for use on or off the airways, are depicted. Thus, a single chart provides all the data needed by the jet pilot. To keep the navigation aids current, during pre-flight planning he need only make corrections thereon, noting changing radio information as shown by his radio facility chart.

A mileage scale is an added feature. First issues of the chart carry the scale on all edges of the reverse

Prior to takeoff, flight leader Capt. James Brooks explains to wingman Lt. Heckman, the letdown procedure at their destination.

Radical changes have been made on an experimental basis with jet letdown charts. This one fits the pilot's coverall pocket.



side, and the scale is being printed on the front also in subsequent editions. A user may fold the sheet over and quickly measure any desired distance.

These charts will be produced for geographical areas other than the United States as they are required. One already has been issued, in restricted classification, for the area including Korea and Japan.

Similar radical changes have been made on an experimental basis in the field of the jet arrival letdown chart. Economy of size and economy of chart information combined with clarity and simplicity characterize the new charts.

In size only 4½ by 7 inches, as compared with the standard 8 by 10½, they are collected in loose-leaf Jet Pilot's Handbooks, which cover each of the overseas areas. With fasteners at the top, they are easily operated with one hand, and they fit readily into a leg pocket of the flying suit, being therefore always handy. These "one-handed" charts, developed with the aid of coordination in the field, have found considerable approval overseas. They will be produced for the United States when criteria have been established.

Only important information, sufficient to take jet aircraft down safely from the en route altitude to a position for landing, is shown. For the first time, the procedure track is printed heavily in dark blue, a color which separates this vital information effectively from terrain and radio data. That color also is best either in daylight or under red light. The back of the chart is an area chart, usable either for planning or for diversion to other than an intended aerodrome if necessary.

Jet arrival letdown charts are frequently revised because of rapid changes in radio information. Speed of revision is such that a maximum of seven days is allowed from receipt of the new information until shipment of the revised chart to its overseas destination. For critical areas that period is reduced to five days.

"Jet pilots can aid the Aeronautical Chart Service materially to make these charts better and better," said its commander, Col. Paul C. Schauer. "Their comments on existing charts and their suggestions for improvements will be of immense assistance in the solution of the charting problems inherent in this new field."

Navigation charts and arrival and letdown charts must be specially produced to meet the unusual conditions found in jet aviation. Here Lt. Thomas G. Davis of the 335th Fighter Interceptor Squadron, reviews a jet pilot handbook prior to takeoff at Andrews Air Force Base.

GCI-GCA TEAMWORK

Hold a Heading and Rate of Descent And You Have a JET LETDOWN!

By Lt. HUGH J. McLAURIN
Larson AFB, Washington

AN F-82 OF THE 325TH All Weather Group, returning to Larson AFB from a night weather mission, lost its range receiver and airborne radar in a thunderstorm. That was in June, 1950, and the letdown procedure which was used in this emergency has been perfected to become SOP for jet pilots of this Central Washington Air Force Base.

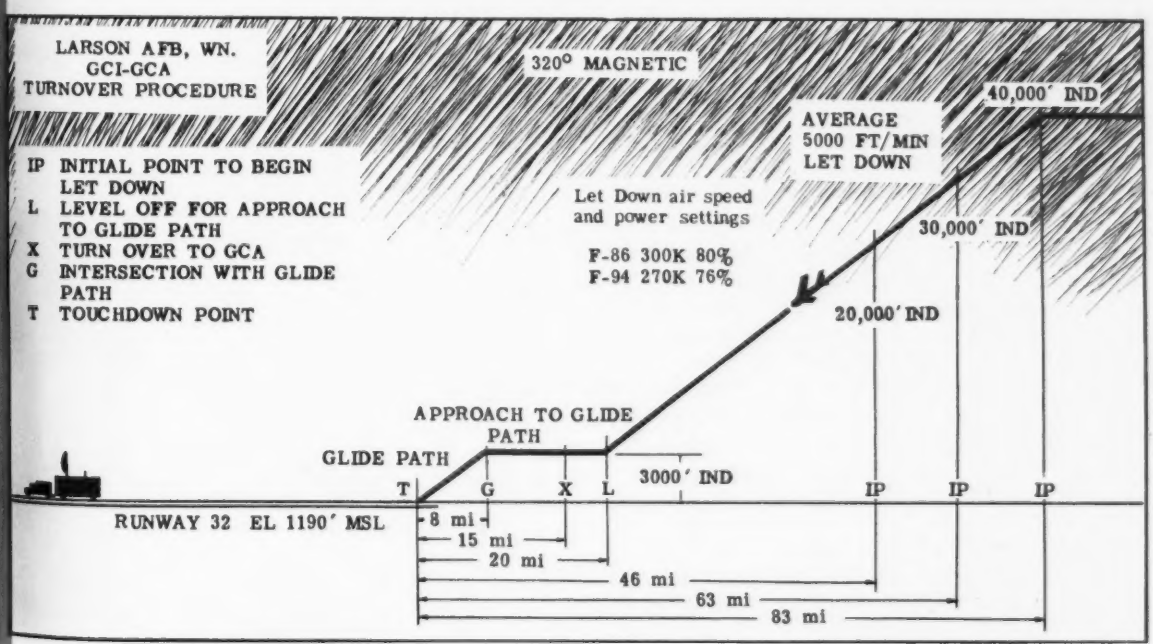
Vectored to Larson by a steer by the Ground Control Interception (GCI) station, the fighter was directed to fly east over an area of level terrain where he descended in a series of timed legs of three minutes each until his altimeter indicated five thousand feet.

A heading was then given which brought the pilot over Larson AFB. Failing to become "contact," the fighter was again directed to the east and advised to descend inbound. On the third pass the radar observer directed the descent until the pilot became "contact" and a successful landing was made.

GCI has been used in letdowns at other USAF bases, and it is the same equipment that monitors and directs USAF aircraft on approaches and departures at certain bases in areas of heavy air traffic. But its successful use in this emergency at Larson, without such a procedure already established, spurred its local development. Experiments in VFR weather using F-82's, F-94's and F-86's were conducted over a period of several months in conjunction with GCA, resulting in a standardized procedure as shown on the accompanying chart.

Constant practice, both in VFR and IFR conditions, has produced a state of proficiency in fighter pilots and controllers that is reflected in the increasing use to which this letdown is being put by the 319th All Weather Fighter Squadron and the 81st Fighter Interceptor Group.

A recent mission is typical of the results obtained from the GCI-GCA-Fighter pilot team. An F-94, flying at 33,000 feet, on top, canceled IFR with Walla Walla radio 100 miles to the southeast of Larson. Calling the GCI station on a channel common to GCI and GCA he was given a heading to Larson. At 75 miles from Larson he was directed to start descent at 270 knots, 76 per cent, dive brakes extended. Still in GCI contact at 20 miles and 3,000 feet he was picked up by the GCA search scopes and directed to final approach. The GCA final approach controller took over at eight miles, and 17 minutes after the initial contact with GCI, the F-94 was taxiing on the ramp at Larson. His approach had been planned and controlled from the ground—his effort consisted of holding a heading, and controlling his aircraft through the descent!



MEDICAL SAFETY

"STAY ON THE BALL"

By ROLAND C. TRAVIS, Ph.D.
Research Psychologist, Directorate of Flight Safety Research

HUMAN NATURE BEING WHAT IT IS, pilots will always be subjected to personal hazards in their own physical and mental makeup. Despite the efforts of modern engineering in designing safer aircraft, the vigilance of maintenance crews in keeping the plane in excellent flying condition, the adequacy of modern landing-aid equipment and personnel, and the over-all safety programs, there remains the pilot with all his human propensities and limitations.

Medical and psychological experiments have thrown much light on the range of many important human abilities in sensing and reacting to situations and in the realm of emotions, special skills and personality quirks. Among these important personal characteristics is vigilance or "keeping-on-the-ball." This factor of alertness in the pilot is important in all phases of modern flying. The pilot must sense what is going on and react accordingly.

Alertness means "keeping-on-the-ball" in a manner satisfactory to the demands of the situation. Alertness does not mean to maintain a keyed-up tension condition all the time. The latter condition occurs frequently in the student pilot who is unfamiliar with the plane and who anticipates possible dangers because of his lack of proficiency. As proficiency is gained through ground simulation-training together with short flights, this keyed-up tension condition is eliminated in most pilots. The main hazards associated with over-tension are

- abnormal and excessive drain on the pilot's physiological and emotional reserve
- tendencies to freeze the controls in emergency situations, and
- over-controlling the plane which may be disastrous.

The tensed-up condition usually occurs in the early stages of learning.

The opposite condition of tenseness, i.e., inalertness, dozing off, boredom and the like, is just as hazardous as the tensed-up condition. The auto driver who falls asleep at the wheel and wakes up in the ditch, the non-vigilant man on watch whose ship is torpedoed, and the pilot staring dazedly at his instruments and flying into the side of a mountain are examples of disasters attributable to inalertness and serious lack of "keeping-on-the-ball." These are everyday occurrences and may happen to anyone. The tendency to doze off during long continued monotonous tasks is a human characteristic which we must accept.

The ideal condition for most effective flying performance is somewhere between a tensed-up condition and a condition of complete relaxation. Neither extreme can be maintained very long without disastrous results. Tension may often be used in a beneficial way. Indeed, many pilots with proved safety records attribute their safety to anticipating major dangers which might overtake them, and to rehearsing how they may avoid disaster. Here lies the essential difference which accounts for their safety. Their tension is expressed in a favorable way, they are ready for emergencies and they keep cool in emergencies.

Relaxation may also be used in a very favorable way. After all, relaxation conserves our energies and if relaxed alertness is to be maintained, certain artificial props must be used during long continued monotonous flights. For example, a lone pilot can shift position and postural attitude, however slight, and find it is helpful.

In roomier planes with pilot and copilot, occasional change of duty is highly desirable. If the pilot can get up and walk around, get a cup of coffee or a candy bar, this tends to break up the monotony to a marked degree. The difficulty with these artificial props is that they must stem from the pilot's own recognition of onsetting inalertness and his willingness to do something about it. Even his ability to recognize fatigue is dulled in long continued flights. Thus, his good intentions may defeat themselves. What is needed is some automatic procedure or device which will tap the energy level of the pilot and warn him of his condition in a manner which would be difficult to ignore.

Such a device has been developed and is called the "alertness indicator," which is an electronic device that picks up and amplifies the electrical output of the body of the pilot. The electric current is picked up from the forehead from small contact tabs in the helmet. This bioelectric current is fed into high gain amplifiers, then to an integrating and triggering circuit which operates a signaling device in the event the tension level of the pilot falls below a certain level. A meter in the output circuit of the amplifier presents a continuous visible indication of the pilot's tension level so the pilot knows at all times at what tension level he is operating.

This device was developed at Tufts College for the Special Devices Center of the Navy Department. After four years of intensive research in the laboratory the device was tested in the field on truck drivers, sub-mariners, radar operators and airmen.

The early experiments showed that alertness status and tension level were highly associated. As tension level went down, alertness also went down. Conversely, as tension level increased reaction time was quicker and the man was more actively on-the-ball. This technique of monitoring the internal workings of a pilot has widespread application to problems of performance level in other occupations and opens new fields of correlating a man's energy output with his performance.

Survival

ON FOOT

Interrogations of personnel who bailed out, or crash landed in difficult country during the last war, indicate that the problem of shoes or footgear caused the most concern.

One of the most repeated and best bits of advice heard by airmen before taking off on a mission was "wear the shoes you will be able to walk home in." The "Natal" boots, loafers and low cuts, the cowboy boots and sandals usually were lost when the chute opened, and the airmen found themselves without shoes. The fancy, pigskin-lined boots that looked so dashing on the ramp rarely held up under the rough usage of tropical jungles. The soles separated from the uppers and the boots shrunk from being immersed in water.

Survivors had very definite ideas on this subject and most concurred in the high top GI shoes with composition sole as the most practicable. Leather sole GI's became slick from jungle dampness and slipped on rocks. Sneakers were ruled out because thorns and sharp sticks so easily penetrated the canvas tops and the lack of arch supports on a long walk left the feet in poor condition.

Improvised "shoes" were made from materials from the plane and some of the items used were tire casings, the rubber coating of the fuel tanks, thin sheets of aluminum, Mae Wests, life jackets, parachute cases and flying jackets.

The important thing to keep in mind is that if you wear the most durable issue shoe and leave the show-off boot in your footlocker, you may come out in style in the event of an emergency. There are no supply issue points in the middle of the jungle or desert to replace the pair of shoes that you have.

Even the best shoes take a beating when you climb over sharp rocks on mountains, cross coral deposits, wade in streams and swamps, or in salt water along a beach. Then if you stick your shoes practically in a fire at night, it is not going to promote longevity in them. The tenderfoot will place a pair of shoes almost in or on a fire in order to dry them, not realizing that one hour of this type of heat is as bad for the shoes as a whole day of hiking over rough rocks.

Before you sleep after wet travel, always remove your shoes and dry them sensibly. This can be done by placing a couple of stakes in the ground and hanging the shoes on them, upside down. This method also will discourage scorpions or other insects from crawling into the shoes and allow the perspiration to dry out. In the event you are in danger of immediate detection behind enemy lines and can't stop to remove and dry your shoes, it is wise to take off the shoes one at a time, wipe the insides as clean as possible with a handkerchief or your shirt tail, and if water is available, wash your feet and put the shoes on, lacing the shoestrings loosely.

On the desert, a good leather or composition sole will protect one's feet from gravel and bunch grass covered surfaces. Generally, loose trouser legs will be more comfortable than improvised wraps or puttees in summer.

Sand dune areas can be crossed barefoot in cool weather but in hot summer weather any desert surface will burn the soles of your feet unless you are a professional fire walker. The average man will sink down in the sand less than an inch when walking across dunes barefooted or with shoes. Sand does slow one's speed somewhat compared to the level plains but it is not a particular handicap when one becomes accustomed to it. Neither is it a condition requiring elaborate preparations for keeping sand out of one's shoes, as some survival literature would indicate.

Remember the civilized man's foot is tender and sometimes it is his only mode of transportation. Take care of those "dawgs" and they will take care of you.

UNANNOUNCED DEPARTURE

THE LEFT ENGINE of the B-26 began backfiring and cutting out. A few seconds later the plane entered a steep turn to the right and started a gentle dive toward the ground. It descended through 2,000 feet of clouds and broke into the clear at 3,000 feet, and still the plane continued in its gentle dive toward the earth.

All this time the passenger in the rear compartment was trying to contact the pilot so he could find out what was happening. The plane continued to lose altitude and when the altimeter in his compartment read 900 feet, the passenger had had enough. He was convinced that the crew had bailed out, left him caged up in the back of the plane, and that the B-26 was headed for destruction.

The passenger bailed out.

A few minutes later the pilot landed the plane safely at the base he had departed, after a flight of only one-half hour.

The pilot had cleared for an IFR flight of several hundred miles and had leveled off at 6,000 feet on t of a cloud layer just a few minutes after takeo Shortly thereafter, the left engine started backfiring a the carburetor air temperature rose to 150°. This w corrected through use of throttle, mixture control a manipulation of the carburetor heat door. The temper ture dropped toward normal and the engine smooth out; however, the pilot decided to abort the flig since continuing involved considerable instrume weather.

He obtained clearance to turn around and make letdown through the cloud layer toward his base. A he did just this.

But the passenger, who, by the way, was a non-flyi officer, had no knowledge of this. All he knew was th the left engine appeared to be giving trouble, that t plane made what he thought was a sharp turn of abo 360°, and that a rapid descent followed—during whic the airspeed built up from 210 to 270 mph. And on to of this, he was unable to contact the pilot on the inte phone. You can't blame him if he felt pretty neglecte and lonely.

Back on the ground after the flight, the interpho system of the B-26 was found to be operating as i should. Questioning of all persons involved disclose that it was probable the passenger did not operate t interphone properly. WHY? No doubt because he w not adequately briefed on its operation.

Taxiing out toward takeoff, the pilot could ha made a communications check with his passenger. H didn't. When the decision was made to turn around an return to base, he could have informed his passenge He didn't. He should have advised the passenger t prepare for landing as he entered the traffic patter He didn't.

In fact, the first time the pilot knew the passenge was gone was when he started looking for him after th B-26 was parked. The copilot, in his statement regard ing the incident, stated that the passenger's "departur from the aircraft was unannounced," that he "gave n indication of his intention to leave the aircraft."

Obviously, the passenger didn't know how to mak such an announcement.

A little prying revealed that the pilot had briefed th passenger on the operation of the parachute, escap hatch, emergency escape procedure, and had told hi to stand by on the interphone. The pilots presumed tha an unidentified airman had briefed him on the use o the interphone. But this, too, is a responsibility of th pilot.

The "unannounced departure" sounds amusing a first. But the errors which led up to it aren't so funn and similar situations could easily result in fatalities Apparently, though, the parachute briefing was good because the passenger's jump was successful—he calle base operations a few minutes after the B-26 landed an asked if they wanted the opened 'chute returned an if so, would they send transportation.

Passenger Briefing

By 1st Lt. JOHN A. FULLERTON
514th Weather Recon Squadron

WAR OF ANY NATURE brings with it various problems and incidents which do not normally occur—some serious, others humorous, and often a combination of both.

Just such an incident, which happened to the officers and airmen of the 514th Weather Reconnaissance Squadron at Andersen AFB, Guam, included the time they stood up bravely while they listened to girlish, oops! ooohs! ahs! and ohs! eyeing freshly-spilled parachutes in a flight briefing prior to a takeoff. But the squadron was ordered into the transport business and the flight was logged as just another Korean war support mission.

Lt. Col. Paul S. Bechtel, commanding officer of the 514th, was informed that the squadron's C-54 was to fly for the United Nations. Maj. Arthur R. Brashear, operations officer for the 514th, was also informed that he would utilize his flying personnel for this operation.

This news was received with a variety of comments by the intrepid "Typhoon Chasers," but these men who fly constantly into the excessive turbulence, swirling winds and torrential rains of typhoons, took the news in their regular stride. A cargo support mission was flown on the same day that the order came down.

All was peaceful for the first few trips, too peaceful, in fact. The boys soon became experts at handling cargo. They were beginning to look upon themselves as regular MATS pilots and crewmembers, with justifiable pride because of their speedy conversion. It was about this time that they learned one thing—that is, there are two types of cargo: "live" and "crated."

This time it was live cargo—the loading list consisted of 30 passengers, seven of them women. The crewmembers had been under the impression, up to then, that in time of war you were supposed to evacuate women to cozy-zone commands. Apparently, war or something had changed.

The women had their orders and the squadron had to comply with them, but the squadron also had a set of Air Force Regulations. One of these regulations was 60-5, which states: "Occupants of Air Force aircraft will be equipped with parachutes on all flights, except as follows: . . ." None of the exceptions covered these operations. So there was the problem. Safety precautions had to be maintained regardless of the difficulty of outfitting seven young ladies with outsized, cumbersome parachutes.

To add to the difficulty, the women showed up at operations wearing dresses instead of slacks. Even though their belongings had already been packed, they were persuaded to return to their quarters and don more appropriate wearing apparel. Just to prove that chivalry was not dead among the pilots of the 514th, 1st Lt. Verlie U. Green, the airplane commander, waited patiently while the change was being made.

Various sizes and types of parachutes were tried on the slack-fitted passengers to obtain a reasonable fit. Regardless of specific instructions, two of the women passengers "yanked at the wrong handle," and parachute nylon was spread over a large area of the loading ramp—a bit premature for a bailout, but a thrilling display of yards of nylon for the ladies.

After a few more delays, explanations of all phases of emergency procedures—ditching and bailout—were given and the passengers were at last well indoctrinated. With everything in order, the aircraft took off.

Although the additional time and effort expended by the crewmembers was exasperating, it paid off.

Two hours out of Guam, with nothing but the vast Pacific beneath, one of the engines caught fire and reality gave the crewmembers an opportunity to put into effect the emergency procedures they had been preaching.

Everyone followed the emergency instructions. Because they knew what to do, there was no panic, and the crew flew the aircraft back to Guam for a safe landing. This, without having been put to the actual test of a bailout or ditching, is a concrete example of the practical value of a thorough briefing of passengers before any flight, regardless of schedule.

CROSS FEED

FLYING SAFETY IDEA EXCHANGE

VHF/DF PIN POINT—

I enjoyed very much the article "VHF/DF Insurance for Pilots," by Col. Anthony G. Hunter. (*Flying Safety,* January, 1951.) To further the benefits of this ideal insurance for pilots I would like to relate some experimenting done while I was base operations officer at Forbes AFB, Topeka, Kansas.

By using the radio compass formula for time out (60 X Time divided by degree of change) we made this experiment:

The aircraft I was flying was given an initial steer followed by a corrective steer. The DF Station then asked me to make a 90° turn to the left and transmit a tone; two minutes later another tone was transmitted and the station gave me a new steer to the station. By relating the degree of change between the two minute transmission, the DF station could give me time out shortly after I made my second corrective steer toward his station. For example, if there were 20° change in two minutes, 60 times two minutes divided by 20° change gave six minutes out. Conversely using ground speed times two minutes divided by 20° change we found that the aircraft was 18 miles out.

I agree that the time and distance formulas are plus or minus the effect of the wind but it is still a closer position than just a heading. Also, lack of sufficient fuel will preclude the use of this extra time en route.

If time permits, however, this system will work and give the ground operator some idea about when the aircraft will pass overhead and be prepared to give reciprocal headings.

In our tests at Forbes, the cooperation of several base pilots were enlisted and results indicated the ground station's figures were very accurate.

I am a strong advocate of DF procedures and I would like to see some study put to this method of giving the pilot time and distance out if he requests such information.

Maj. Thomas M. Glassburner
9th Wing Operations Officer
Travis AFB, California

Microphone "MADHOUSE"
"TESTING, 1...2...3. SPLTTTT! TESTING, 1...2..."
"C'MON UP AND JOIN THE FORMATION"
THINKS HE'S ON INTERPHONE
"NOW, THIS NO. 6 STALL IS DONE IN THE FOLLOWING MANNER,...FIRST..."
"GIT ON INTERPHONE STOOPID!"
"TURN ON YOUR LANDING LIGHTS SO I CAN SPOT YOU!"
• USE THE PROPER RADIO TECHNIQUE AND PROCEDURES
• ELIMINATE UNNECESSARY "GAB"
• CLEAR THE AIR FOR EMERGENCIES

UNSAFE COMMUNICATIONS—

Headquarters, Airways and Air Communications Service, has called attention to the fact that numerous accident reports received by AACS indicate that at some locations it is the practice of operational flights and squadrons to return to base in formation and enter the landing pattern with only the flight leader obtaining landing clearance from the tower. As a result of this practice, control tower operators are often unable to advise individual aircraft i the flight of hazardous developmen such as gear not extending, obstru tions on the runway, wind change etc.

AACS recommends that fligh leaders advise all elements to chang to tower frequency at the time th flight is cleared for landing so as t insure monitoring of the contr tower frequency by all aircraft in th landing pattern.

MITCHEL LETDOWN—

Word comes from Mitchel AF New York, that not all pilots a tempting standard instrument ap proaches on the Mitchel Range a making use of the homing beac located on the center line of the i strument runway.

The radio beacon (201 kc's—ide —M-) is shown in the Pilot's Hand book of letdown procedures. Aft passing the low cone of the Mitch Radio Range at prescribed altitud the radio compass can be tuned t the homer and the plane flown di rectly to it. By the time the radi compass needle has indicated th plane has passed over the beaco Bartow lights should become visib leading to the runway straig ahead.

RADIO CHATTER—

We have been having considerab trouble with too much chatter on th radios at this station. We have, o course, lectured and preached again it and it has had some effect but ca toons by 1st Lt. Jack Tippet, of th base, have possibly had more effe than all the words spoken.

Capt. Frank P. Klotz
Wing Flight Safety Officer
Reese AFB, Texas

(One of the Reese AFB Safet posters is reproduced on this page.— Ed.)

KEEPING CURRENT

REMOVABLE BLISTER—As a result of recommendations from the Directorate of Flight Safety Research, the Boeing Airplane Company has designed a removable blister for the rear compartment of B-50 airplanes. In a demonstration one was removed by one man in 25 seconds. The design, relatively simple, will be installed on B-50's at an early date.

EXCHANGE PROGRAM—To effect better unity, an officer exchange program between the USAF and the RAF is underway in Britain and elsewhere. Each day at a number of British bases, American pilots lead flights of British flyers on maneuvers. At the same time, British experts and technicians hold command positions with USAF.

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BIG HOP—In a 2400-mile flight from Travis (formerly Fairfield-Suisun) AFB, California, to Hickam AFB, Hawaii, an ARS Grumman SA-16 completed the longest overwater flight ever made by the twin-engine amphibian. Carrying no special gear for the flight, the modified SA-16 carried fuel in the wing floats in addition to droppable fuel tanks under each wing.

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FLIGHT PLANS—A new civil flight plan form will make it easier for pilots to file flight plans according to a recent CAA announcement. Flight plans are now compulsory for civil pilots flying into or within Air Defense Identification Zones. The new form covers VFR, IFR and Defense VFR flight plans, with less information required for the VFR flights.

HELICOPTER SURVEYORS—Using a Bell helicopter, a lead-weighted line and some ingenuity, Army engineers have unveiled for the first time the profile of the Niagara River bed just above the Niagara Falls. First accurate soundings of these waters from the crest of Horseshoe Falls upstream for one mile to the head of Goat Island have been completed through the use of the helicopter. The surveying information brought out in the long-sought-for answers will provide ultimately the means for the preservation of the Falls and at the same time allow for more power to be generated by both the United States and Canada.

NEW ENGINES—USAF has awarded a contract to the Douglas Aircraft Company for a turbo-prop version of the C-124 "Globemaster II," heavy transport aircraft. Designated the YC-124B, the new plane which is now under construction, will be powered by four YT-34-P-1 turbo-prop engines, rated at 5500 hp each. Current C-124's are powered by four R-4360 piston engines rated at 3500 hp each.

Installation of the new engines is expected to increase the speed, range, payload, rate of climb, and service ceiling of the plane, and to decrease the takeoff distance. Other new features include equipping the aircraft with wingtip heating units for thermal de-icing of the leading edges of both wings. Use of this system makes it unnecessary to "bleed" heat from the engine compressors for wing de-icing. The new C-124 will have a pressurized flight crew compartment to permit continued operation at higher and more economical altitudes.

ATOM BOMB TRAINING—SAC has launched an atom bomb training program for flyers who may be involved in flying B-36 long-range bomber missions. According to SAC, the bomb requires different ground-handling equipment, different bomb racks and different in-flight checking procedures.

NAVY INTERCEPTOR—Newest Navy interceptor—the Douglas XF-4D—has been successfully test flown at Edwards AFB, Muroc. The XF-4D, resembling a manta ray in appearance, with modified triangle wing and slim protruding nose, was designed to catapult off carrier decks for fast interception of enemy planes before they can attack fleet or ground installations.

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EMERGENCY TRANSMITTER—The 514th Weather Recon Squadron at Guam has reported that a dropsonde can be used to transmit emergency messages when an aircraft's transmitter gives out. By opening the white wire on the "on-off" switch and the green wire at the relay, with both exposed when the front panel is removed, it is possible to key the transmitter by touching the chassis with the end of the green wire. Dropsonde (AN/AMT-3) is the transmitter used by Air Weather Service. It is dropped from a weather reconnaissance aircraft by parachute.

TARGET FOR LIGHT GUNS—CAA has developed a paper target to be used by its technicians in checking airport control tower light "guns" on the ground for accuracy and for setting the sights. Focusing and sighting these light "guns" requires technical skill, and definite procedures must be followed. The new targets consist of a cross within a shaded circle about eight inches in diameter and can be set up in the average tower to make it easier for maintenance technicians to service the guns and keep them accurate.

ARCTIC SURVIVAL TRAINING—With arrangements being made by Headquarters Air Rescue Service and the 2156th Air Rescue Unit, MacDill Field, Fla., classes have started for the Arctic Phase of the Land Rescue-Survival training at Goose Bay, Labrador. The first class started the training last month.

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NAVY ORDERS TURBO-PROPS—The first production order for turbo-prop engines in the U.S. has been placed with Allison by the Navy. The order covers an initial quantity of T40 engines which power the Convair XP5Y and the Douglas XA2D Skyshark. The T40 turbo-prop engine has a guaranteed static rating of 5500 hp, and it has twin power sections connected by extension shafts to a reduction gear driving contra-rotating props. Each power section drives both propellers and for cruise, single power sections can be declutched to provide improved fuel economy.

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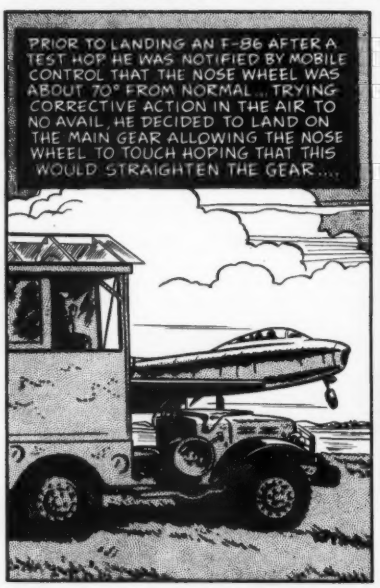
BRIEFLY NOTED—Clarence Belinn, President of Los Angeles Airways, has predicted that 8-ton transport helicopters carrying 24 passengers will be operating in and out of Los Angeles on commuter schedules in three years . . . CAA is favoring legislation authorizing a $150-million pilot training program, but is waiting for the views of the Air Force before formally endorsing such a program . . . Taking a big step-up in power, the Douglas A3D attack fighter will become a turbo-jet plane powered with the new J-40 engine, in the 10,000-pound thrust class . . . The jet helicopter is fast becoming a reality with Sikorsky and Hiller carrying out experiments with jet-powered rotor systems in addition to the helicopters currently being tested under USAF contracts . . . One hundred ground crewmen and two dozen pilots took part in the test programs of the Lockheed F-94 all-weather fighters that accomplished in 30 days what would have required six months of wartime flying. Three F-94's were flown continuously by shifts of pilots with maintenance men working in round-the-clock shifts.

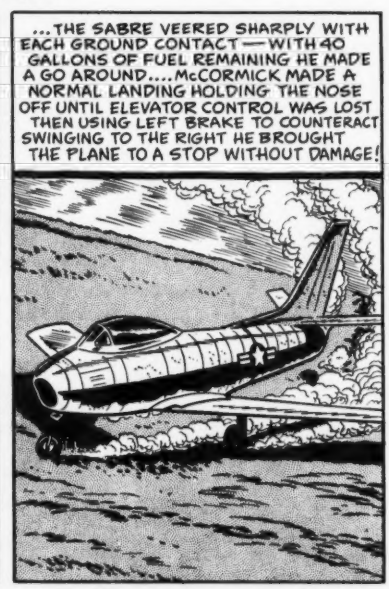
WELL DONE!

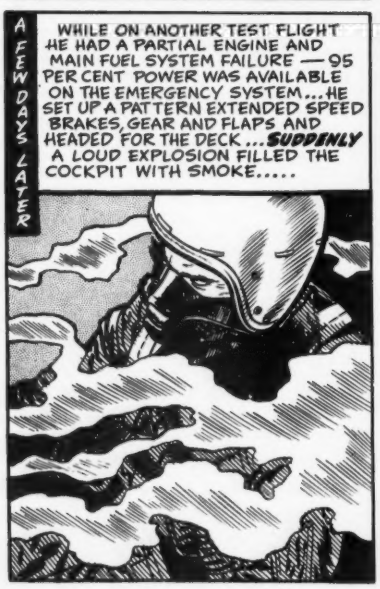
to

1st Lt. T. M. McCORMICK

OF THE 59TH FIGHTER-INTERCEPTOR SQ - 33D F/I WING - OTIS AFB.


PRIOR TO LANDING AN F-86 AFTER A TEST HOP HE WAS NOTIFIED BY MOBILE CONTROL THAT THE NOSE WHEEL WAS ABOUT 70° FROM NORMAL... TRYING CORRECTIVE ACTION IN THE AIR TO NO AVAIL, HE DECIDED TO LAND ON THE MAIN GEAR ALLOWING THE NOSE WHEEL TO TOUCH HOPING THAT THIS WOULD STRAIGHTEN THE GEAR....


...THE SABRE VEERED SHARPLY WITH EACH GROUND CONTACT — WITH 40 GALLONS OF FUEL REMAINING HE MADE A GO AROUND.... McCORMICK MADE A NORMAL LANDING HOLDING THE NOSE OFF UNTIL ELEVATOR CONTROL WAS LOST THEN USING LEFT BRAKE TO COUNTERACT SWINGING TO THE RIGHT HE BROUGHT THE PLANE TO A STOP WITHOUT DAMAGE!


A FEW DAYS LATER
WHILE ON ANOTHER TEST FLIGHT HE HAD A PARTIAL ENGINE AND MAIN FUEL SYSTEM FAILURE — 95 PER CENT POWER WAS AVAILABLE ON THE EMERGENCY SYSTEM... HE SET UP A PATTERN EXTENDED SPEED BRAKES, GEAR AND FLAPS AND HEADED FOR THE DECK... SUDDENLY A LOUD EXPLOSION FILLED THE COCKPIT WITH SMOKE.....

COMPLETE ENGINE FAILURE FOLLOWED WITH A TAIL PIPE TEMP. OF 1000° C. PLUS LOSS OF SURFACE CONTROL BOOST... SELECTING A CLOSER RUNWAY HE LANDED SAFELY..... LT. McCORMICK'S GOOD JUDGEMENT AND QUICK THINKING PLUS SHARP PILOT PROFICIENCY SAVED TWO EXPENSIVE JET FIGHTERS WITHIN A WEEK!!!
IT PAYS TO KNOW THE AIRCRAFT YOU ARE FLYING!!

Flying Safety

~~RESTRICTED~~

DEPARTMENT OF THE AIR FORCE
THE INSPECTOR GENERAL, USAF

Major General Victor E. Bertrandias
Deputy Inspector General
For Technical Inspection and
Flight Safety Research

DIRECTORATE OF
FLIGHT SAFETY RESEARCH
Norton Air Force Base, California

Brigadier General O. F. Carlson, Director

Vol. 7, No. 3 MARCH 1951

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~~RESTRICTED~~

a Mayo—Warner Brothers

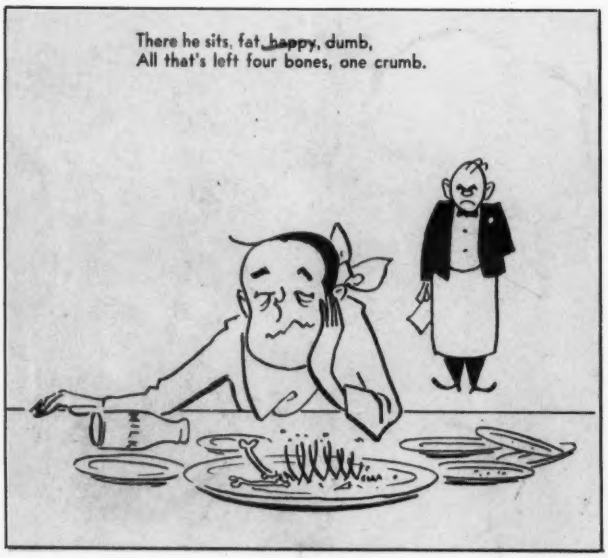
don't gripe - WRITE!

can influence DESIGN and OPERATIONAL EFFICIENCY

Mail from home is important, sure, and so is mail from YOU when it is a complete U.R. on malfunctions of your aircraft. Immediate action will be taken and corrective instructions issued on Unsatisfactory Reports submitted concerning USAF equipment, the use of which involves SAFETY or COMBAT EFFECTIVENESS. T. O. 00-35D-54 shows you how, and it's easy to address reports and drop them in a mail box. *In an emergency, send a wire.*

Mal Function

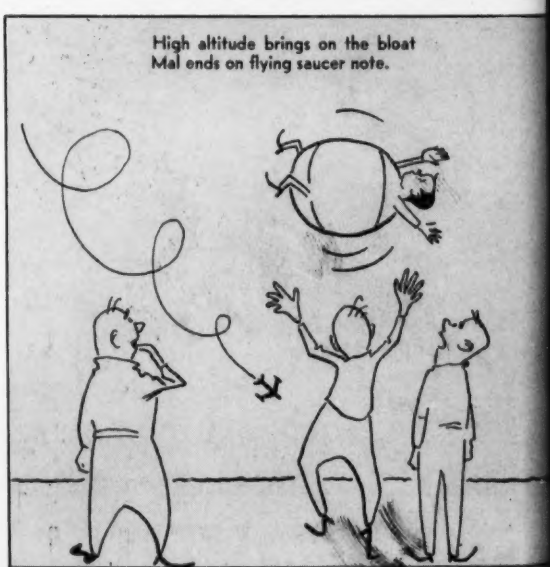
Mal sinks fangs into a feast;
Enough for two of him, at least.



There he sits, fat, happy, dumb,
All that's left four bones, one crumb.

A night of pills and misery
Follow all this revelry.

Morning finds him light as lead—
Man-hole cover for a head.



High altitude brings on the bloat
Mal ends on flying saucer note.

U. S. Government Printing Office: 1951—